MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for April, 1904, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 167; West Indian Service, cable and mail, 4; River and Flood Service, regular 43, special river and rainfall, 190, special rainfall only, 56; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 3025; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. R. C. Lydecker, Territorial Meteorologist, Honolulu, Hawaii; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; Rev. José Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

During April, 1904, barometric pressure was low over the British Isles and high over the middle longitudes of the Atlantic Ocean.

In the United States barometric disturbances were deficient in seasonal energy and, with one or two exceptions, were abnormally slow and erratic in their movements.

The first noteworthy American disturbance appeared on the eastern Rocky Mountain slope on the 6th and reached the Mississippi Valley on the 7th. On the morning of the 8th the disturbance was central over Iowa, with reported barometric minimum, 29.12 inches, at Des Moines. Heavy rain had fallen in the Mississippi, Ohio, and lower Missouri valleys, and the east Gulf States, and high winds were general throughout the central valleys and the upper Lake region. On the morning of the 9th the disturbance was central over the southern end of Lake Michigan, with barometric pressure 29.44 at Chicago. Snow was falling in the upper Lake region and upper Mississippi Valley, the rain area had extended to the north Atlantic coast, and freezing temperature was reported in the West and Northwest. During the 9th the disturbance moved northeastward over Michigan with rapidly diminishing strength.

A disturbance of moderate intensity moved eastward over the Great Lakes during the 11th.

On the 15th a disturbance moved rapidly eastward over the Mississippi and Ohio valleys, and reached the southeastern New England coast on the morning of the 16th, attended by high winds that attained a velocity of 72 miles an hour from the northwest at New York. By the evening of the 16th the center of disturbance had disappeared in the direction of Newfoundland. The passage of the storm was attended by heavy snow and high winds in the Lake region, in anticipation of which the following warning, based upon the morning reports of the 15th, was telegraphed to lower Lake stations:

> Heavy snow and high easterly shifting to northerly winds indicated for the lower Lake region to-night.

By the morning of the 16th three to twelve inches of snow had fallen in the Lake region.

From the 23d to the 27th a disturbance moved slowly eastward from the Plateau region to the Virginia coast, attended throughout its course by heavy rain and high winds. On the 24th severe local storms and torrential rains were reported in areas in the West and Southwest, and freshets occurred in the smaller streams of eastern Kansas. During the 25th heavy rain continued in the lower Missouri Valley, causing rivers to rise rapidly. Along the smaller streams of that section considerable farm property was flooded. At Jefferson City, Mo., the Missouri River rose above the danger line. On the 26th the Mississippi River at St. Louis reached a stage of 31.5 feet, and the river continued to rise at that point until 6 p. m. of the 29th, when a stage of 33.6 feet was reached. The usual advices regarding the rise in the lower Missouri and the Mis-

sissippi, below the mouth of the Missouri, were issued in time to serve all interests concerned.

During the second decade of the month melting snow in the mountains caused rapidly rising stages in the rivers of the north Pacific coast. Owing to ample warnings very little damage resulted.

From the 17th to the 22d heavy frost occurred in the Ohio Valley and the Middle Atlantic States, and on the 20th frost was general in Maryland, Virginia, and northern portions of Georgia and the interior of the Carolinas.

NEW ENGLAND FORECAST DISTRICT.

Viewing the month as a whole the weather was very unpleasant, the temperature being exceptionally and uniformly low and the precipitation decidedly in excess of the average. A storm of marked severity, considering the season, accompanied by very heavy rain and strong to high northeast gales prevailed during the 27th and 28th. The gales were of unusual force along the southern New England coast, and by many were considered the heaviest ever known at this time of the year. All shipping remained in the harbor, timely warnings having been given of the approaching storm and, so far as known, no casualties resulted.—*J. W. Smith, District Forecaster.*

WEST GULF FORECAST DISTRICT.

The month opened with showery weather over the greater portion of the district and showers were reported from some part of the district every day during the first nine days. These conditions were generally covered in the forecasts. Frost occurred in the northern portion of the district on the 10th and 13th, for which warnings were issued. Warnings for frost were issued for other dates, on most of which the temperature fell to about the frost point.

No general storm occurred along the Gulf coast during the month. Conditions appeared which warranted the issue of warnings on three dates.—*I. M. Cline, District Forecaster.*

NORTH CENTRAL FORECAST DISTRICT.

Unseasonably cool weather prevailed over this forecast district during the entire month. No general cold-wave warnings were issued, and the storm-warning service on the upper Lakes was not in operation on account of the lateness of the season. Advices were sent to ports on Lake Michigan for the benefit of the companies which maintained winter navigation. No casualties occurred during the month.—*H. J. Cox, Professor and District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

No severe storms occurred during the month. Frosts were frequent, but there was no serious damage; as a rule their occurrence was accurately forecast.—*F. H. Brandenburg, District Forecaster.*

SOUTH PACIFIC FORECAST DISTRICT.

The month was, as a whole, uneventful and in decided contrast to the preceding month, which was one of frequent and heavy rainfalls. At the beginning of April moderate showers fell throughout California. There appeared to be a tendency for depressions forming in the intermountain region to move rapidly southward over the Valley of the Colorado. A slow-moving area of high pressure rested over the western half of the country from April 5 to 12, and was accompanied by generally pleasant weather on the Pacific slope. On April 14 a well-marked depression moved southward on the western edge of the high, and for several days following the disturbance seemed to linger over Utah and Arizona. On April 18 a moderate depression overlay the Pacific slope, and high southerly winds and generous rains were reported generally on the 19th.

Light to heavy frosts occurred on the morning of the 20th, following the eastward march of the depression. On the morning of April 21 the disturbance crossed the Rocky Mountains. Another marked depression appeared over Nevada on the morning of the 26th.—*A. G. McAdie, Professor and District Forecaster.*

NORTH PACIFIC FORECAST DISTRICT.

Several damaging frosts occurred in the North Pacific States during April, for which timely warnings were issued. The winds were moderate and storm warnings were only issued on two occasions.

The most noteworthy feature was an unusually severe hot spell beginning on the 7th and lasting until the 15th, which caused the snow in the foothills to melt very fast and all rivers, creeks, and lakes in this district to rise rapidly. This hot spell was followed by temperatures, as a rule, below normal, with the result that the snow afterwards melted more gradually, and, except in a few small streams, no damaging floods occurred.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

The April flood in the lower Mississippi Valley passed into the Gulf of Mexico without exciting apprehensions beyond those that would naturally be caused by any flood, and with but little or no damage or inconvenience. In the Memphis district alone were any fears expressed. The river at Memphis reached a stage of 39.0 feet on April 10, but 1.1 feet below the great high-water mark of the previous year, and it was thought that possibly the weak places in the levees at Luxora and Golden Lake, Ark., might give way, and also that the enormous strain would prove too powerful for the levees in the St. Francis district. Fortunately, none of these fears were realized; the river remained stationary at 39.0 feet from the 10th to the 12th, inclusive, and then began to fall, passing below the danger line of 33.0 feet during the morning of the 22d. Below Memphis the stages reached were from 3.0 feet to 6.0 feet lower than those of 1903, and nothing of unusual interest was chronicled. The usual warnings were issued about ten days in advance of the flood waves, and no reports of loss or damage have been received.

The heavy rains of the 23d–26th, inclusive, over the lower Missouri and upper Mississippi watersheds, caused the rivers to rise to the danger lines at almost all points, and in some places somewhat higher. In the lower Kansas River there were fears of a repetition of the disasters of 1903, but they were soon allayed by the early cessation of the rains. The Weather Bureau warnings of the floods enabled all interested to remove or protect their property whenever effective measures were possible. However, many thousand acres of bottom lands along the Mississippi River which had been planted to wheat were overflowed and the wheat was almost totally destroyed. The bottoms opposite Louisiana, Mo., which were submerged during the great floods of 1903, due to a crevasse in the Sny levee, were again overflowed, and it is estimated that about 30,000 acres of wheat were overflowed. Much of the overflowed land has been planted in corn since the subsidence of the waters.

The following report on the flood at Hannibal, Mo., and vicinity was made by Mr. B. L. Waldron, Official in Charge, United States Weather Bureau office, Hannibal, Mo.:

The river was 0.9 foot above the danger line on the first of the month, but fell steadily until the 22d, except that a slight rise occurred from the 8th to the 11th. The heavy rains in Missouri and southern and central Iowa from the 24th to the morning of the 26th caused an unusually rapid rise in the river in the vicinity of Hannibal; the danger line was passed on the 25th, and the crest was reached on the 28th, with a stage of 16.4 feet.

Flood warnings were issued at 10:45 a. m. of the 26th, and it was then estimated that a stage of about 17 feet would be reached on the 28th; on the 27th those interested were advised that the crest would arrive on the 28th with a stage a little above 16 feet.

The Salt River overflowed its banks by the morning of the 25th, and extensive wheat fields and other lowlands were overflowed. Bear Creek cross levee, Indian Grave district, broke on the 23d, and a considerable

area was overflowed; the Lima levee, south of Meyer, broke on the 24th, and north of Meyer on the 26th, the water overflowing hundreds, and perhaps thousands of acres of land, much of which was in wheat and oats. Long Island, near Quincy, was overflowed, and stock was taken off by boats on the 26th. There were also large areas overflowed in the Fabius Valley. Most of the residents of Bay Island moved to the mainland on the 27th, nearly all of the islands being then under water. On the night of the 27th the boathouse at Hannibal was almost surrounded by water, and some cellars were flooded.

It was estimated that 15,000 to 20,000 acres of land between Hannibal and Quincy was overflowed, and also 30,000 acres opposite Louisiana, Mo.

The damage from this flood consists largely of washing out new levee work, causing to the contractors the delay and expense of moving to highland and return.

Wheat on the overflowed lands was not much injured; it was already in poor condition, and the water left it before doing much damage.

In East St. Louis and vicinity the high water occasioned considerable inconvenience and some alarm for a few days, but no material damage was done.

A moderate flood in the Pittsburg district on the 1st and 2d was well covered by preliminary warnings, and no damage resulted, except the flooding of cellars and the covering of some railroad tracks.

In the lower Ohio and its tributaries, the flood, which was quite marked, was made the subject of the following report by Mr. P. H. Smith, Official in Charge, United States Weather Bureau office, Cairo, Ill:

The first important rise in the lower Ohio River during the present spring occurred at Evansville from March 5 to 14, inclusive. The stage of water reached on that rise was 36.2 feet. The river commenced falling on March 14 and continued falling until the 23d, when a second rise started in, which crested at 39.3 feet at 9 a. m., March 31. The river remained stationary at that stage until some time during the evening of April 1, when it again began to rise slowly and continued rising until the morning of April 3. The highest stage reached was 39.8 feet. The river commenced to fall on April 4, and passed below the danger line at 9 p. m. of April 10.

The official in charge at Evansville was advised by wire on the morning of March 26, when the river at that point was 31.3 feet, that the danger-line stage of 35 feet would be reached within thirty-six hours. The exact time was 4 p. m., March 27. On this date the official at Evansville was further advised that the maximum stage at that place would be between 39 and 40 feet. These warnings were disseminated as widely as possible. The official in charge at Evansville in reporting upon the flood states:

"All river interests were given timely notice in regard to the maximum stage expected. While the high water caused more or less inconvenience by submerging some parts of the roads in the bottom lands, and will also somewhat delay spring plowing, no direct damage can be attributed to it in this vicinity."

The rise during the first half of March at Paducah and Cairo caused only a moderate tide. The river commenced falling at Paducah on the 17th and at Cairo on the 18th. Another rise set in at Paducah on the 24th, which crested on April 4 at 44.7 feet. The fall set in on the morning of April 5, and the river passed below the danger line of 40 feet during the night of April 10–11.

At Cairo the river commenced rising again on March 24, reached 49.1 feet on the morning of April 5, commenced falling by the afternoon of April 5, and passed below the danger line of 45 feet on April 13. The maximum stage forecast for Cairo was 48.5 to 49.0 feet. The remarkably high stage at Cairo, considering the moderate floods out of the upper Ohio and the southern tributaries of the lower Ohio, was due in part to torrential rains over southern Illinois during March 24–25.

No material damage resulted from the flood in the vicinity of Cairo. Railroad traffic at Birdspoint, Mo., across the river from Cairo, was interfered with for a short period. Lowlands were flooded and wheat damaged somewhat. The damage to wheat will not, however, exceed 10 per cent unless later floods follow. At Birdspoint about 40 per cent of the lowland behind the Cotton Belt tracks and the levees were submerged. This is the smallest amount of land ever submerged at so high a stage of water in this vicinity.

The flood in the lower Tennessee Valley was not of much importance. Warnings were sent out well in advance of the flood and no damage was done that could have been prevented by warnings. At Florence the river reached a maximum stage of 17.2 feet on March 27–28. At Johnsonville the maximum stage reached was 28.1 feet on March 29. Warnings issued to points on the lower Tennessee were bulletined and distributed by mail. Lumber and cross-ties were the principal properties protected. The observer at Florence estimates that property in that vicinity valued at about $40,000 was protected, but states that there was practically no danger.

The most damaging flood occurred in the lower Wabash. A rise during the early part of March brought the stage at Mount Carmel up to 19.7 feet on the 14th. This rise caused little or no damage. The river fell to 15.5 feet by the morning of March 21, when a second rise began which crested at 27.1 feet on April 2. The river commenced falling by the morning of April 3 and passed below the danger line (15 feet) on April 17.

Warnings were telegraphed to Mount Carmel and several other points affected, and distributed from those points to other river towns. The maximum stage forecast for Mount Carmel was 28 feet. The maximum stage reached was 27.1 feet. The river at Mount Carmel would probably have reached 28 feet, or higher, had not some of the levees in that section given way.

Reports from the flooded Wabash district show that the warnings were of great value. The observer at Mount Carmel reports that, on account of the warnings, farmers had time to remove their families and stock.

Mr. Henry Johnson, of Owensville, Ind., reports as follows:

"Relief parties were sent out to the flooded districts, and telephone messages giving warnings of danger were sent to all neighborhoods. Many relief parties were sent out in boats to remove people and stock to places of safety. The warnings enabled us to save most all property exposed to danger.

The rivers of the Pacific States were moderately high during the month, but the situation developed nothing of particular interest.

The last ice of the season in the Mississippi River was reported at Prairie du Chien, Wis., on the 2d. On the 26th the first boat of the season arrived at St. Paul, coming from Wabasha, Minn. In the Missouri River the ice moved out at Williston on the 4th and 5th, and at Bismarck, N. Dak., on the 6th. The last ice of the season passed Sioux City, Iowa, on the 12th, and Omaha, Nebr., on the 13th. At Pierre, S. Dak., local navigation for the season was opened on the afternoon of the 10th. The Penobscot River opened on the 8th. No ice was reported from any other river of the Atlantic system.

The highest and lowest water, mean stage, and monthly range at 201 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, District Forecaster.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during April are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—Dry, cool month, favorable for work, but unfavorable for germination and growth; local damage by frost and hailstorms. Cotton made generally poor stands; considerable not up, much replanting in progress. Upland corn made slow growth; planting of lowland corn retarded by dry, hard soil. Wheat and oats heading low during last decade, when all minor crops were backward; strawberries yielded well; fruit prospects continued good, except in some northern and western counties.—*F. P. Chaffee.*

Arizona.—Generally dry weather, with high, drying winds, and at times abnormally low temperatures, accompanied, except in the warmest sections, by light to killing frost, prevailed during April. In the lower Colorado Valley, where irrigation water was abundant, crops made fine growth. In the other parts of the Territory, however, crop conditions were generally very poor, and considerable injury to fruit, as well as other crops, resulted from frost. Range feed and stock water were scarce and stock suffered greatly.—*M. E. Blystone.*

Arkansas.—Cool temperatures with early excessive rains delayed farm operations and were unfavorable for germination. Cotton planting progressed slowly; the early planted came up to only a fair stand and replanting was necessary in some sections. Corn planting was well advanced by the close of the month; the stand was irregular and there was some replanting. Small grains and gardens made slow growth. Peaches

and apples deteriorated slightly, but good yields were indicated. Berries were late but abundant.—*Edward B. Richards.*

California.—Nearly normal weather prevailed during the month, excepting the abnormally high temperature on the 10th and 11th. No material injury to crops resulted from the heat, and the frequent showers were very beneficial. Deciduous fruits escaped damage by frost this season, but some varieties were injured by the continued cool, wet weather in February and March. Oranges were in bloom by the 15th in the Sacramento Valley and southern California. Wheat prospects were improving toward the close of the month.—*Alexander G. McAdie.*

Colorado.—Seeding advanced favorably, except in dry localities; sugar beets were mostly planted, and the planting of corn, potatoes, melons, and gardens progressed satisfactorily; alfalfa backward; eastern ranges practically dormant. Fruits were slightly injured by frosts. Snowfall considerably below normal; less than usual flow indicated for latter part of season, although average flow probable for May and June from localities in central mountain districts.—*F. H. Brandenburg.*

Florida.—Dry weather and cool nights retarded germination and growth generally. Early cotton pushed forward slowly and late planted germinated unsatisfactorily; much replanting was necessary, which was delayed; general prospects only fair. Corn advanced fairly well, though growth on upland showed need of rain; some fields turned yellow. Citrus trees lost considerable fruit owing to drought and red spider. The pineapple crop will be short. Cane, vegetables, and minor crops did well.—*A. J. Mitchell.*

Georgia.—A cool, dry, and generally disagreeable month. The average precipitation was the lowest on record for April. At the close of the month drought prevailed in all sections and crops were backward. Growth of cotton was slow; poor stands; many fields plowed up and replanted; seed scarce; no decided increase in acreage. Indicated yield of peaches largest in many years, but fruit in about fifteen northern counties was killed on the 4th and 5th by frost.—*J. B. Marbury.*

Idaho.—The month was somewhat warmer than the average, with precipitation generally deficient. Snow in the mountains melted rapidly, resulting in unusually high water in streams. Vegetation made satisfactory growth. A large acreage was prepared for sugar beets and a considerable amount of beet seed was planted. Stock was turned on the range and made good gains. A good clip of wool and a good percentage of lambs reported—*Edward L. Wells.*

Illinois.—The weather was unseasonably cold and vegetation made slow growth. The sowing of oats, begun during the first decade, was practically finished at the end of the month. Plowing for corn was well advanced by the 25th, under favorable conditions. The fruit prospect was generally promising, except for peaches.—*William G. Burns.*

Indiana.—Bottom and flat lands were too wet to work, and, with the exception of two or three brief periods, the month was unseasonably cold. Prospect for wheat was poor; during last of month large acreage plowed up. Rye and old clover was fairly promising. Peaches dead in many localities and generally only a light crop was indicated; other fruit prospects fair to excellent. Plowing for corn, planting potatoes, making gardens, and preparing ground for tomatoes, peas, and sweet corn were under way.—*W. T. Blythe.*

Iowa.—This was the coldest April of which we have records covering all districts of the State. The precipitation was above normal, but there was sufficient clear weather to give opportunity for seeding wheat, oats, and barley in fairly good season. Considerable progress was made in preparing ground for corn planting, and rather more than the usual area was in readiness by the close of the month. Vegetation and fruit bloom were unusually late.—*John R. Sage.*

Kansas.—Cold month; dry first half, abundant rains latter half. Wheat improved materially; soft wheat began heading in south last week. Corn planting continued; early corn came up in southern counties the latter part; some cultivated the last week. Cool weather retarded growth of oats and prairie grass, but alfalfa grew rapidly. Early apples and peaches bloomed; the apples and seedling peaches gave very good promise—*T. B. Jennings.*

Kentucky.—Cool, wet weather retarded farm work and delayed germination of seed and growth of plants. Wheat, oats, and grass made very little progress. Corn planting was not half completed and what was planted came up very slowly. Tobacco plants were very small, but healthy. Gardens and truck crops were very backward. Severe frosts on the 17th and 21st damaged fruit very seriously. Pastures were late starting and stock not in very good condition.—*S. P. Gresham.*

Louisiana.—Weather favorable for outdoor work. Cotton planting progressed rapidly, but low temperature in central and north portions retarded germination and growth; some replanting necessary; cultivation kept pace with growth of plant. Sugar cane and rice did well, but needed warm, showery weather. Corn looked sickly over the north portion, but was healthy over the south portion and being laid by. Truck gardens did well. Oats were heading. Irish potatoes of excellent quality were giving good yield.—*I. M. Cline.*

Maryland and Delaware.—Poorly distributed rainfall made much ground too wet to work during the first decade and again during the last week. Work progressed rapidly from the 10th to the 25th. Wheat made great improvement, but was below normal. Grass afforded little pasture. Oat seeding was general the first half of the month and good stands resulted. Some corn was planted the last decade. All fruits, except peaches, bloomed profusely and promised large yields. Peas did well.—*Oliver L. Fassig.*

Michigan.—April was cold and the rainfall poorly distributed. All vegetation very backward. Plowing was not generally begun until about the 20th; early oats, early potatoes, and barley were seeded in the southern and central counties during the last decade. Fruit buds at the close of the month were very small. Winter wheat, rye, meadows, and pastures were in poor condition, wheat being particularly bad. Early seeding germinated very slowly on account of the dry, cold condition of the soil.—*C. F. Schneider.*

Minnesota.—Temperatures were low till the end of the month. Heavy snow was general on the 7th and 14th. No seeding in the Red River Valley during the month, while that begun early on high light lands in central and southern sections was much hindered till the last week, when wheat and oat seeding was nearly finished, and barley seeding was begun, with preparations going on for flax, barley, potatoes, and corn; grass growing slowly.—*T. S. Outram.*

Mississippi.—Planting was about completed, but germination and growth were much retarded by unseasonably cool weather. Generally good stands of early corn were secured and cultivation was in progress south, but late plantings came up slowly. Considerable early cotton was up to fair stands and being chopped south, but very little appeared above ground in the north. Oats did well. Cane came up to fairly good stands. Strawberries and vegetable crops were yielding well and tree fruits were generally promising.—*W. S. Belden.*

Missouri.—The month was colder than any previous April during the past seventeen years. Over a considerable portion of the State the precipitation was excessive, causing destructive floods. These conditions were generally unfavorable for work and growth. In some southern counties fair progress was made with corn planting, but much corn rotted in the ground. Wheat continued to improve but made slow growth, as did also oats and grasses. The outlook for fruit, except peaches, was very promising.—*A. E. Hackett.*

Montana.—Mild temperature the greater part of the month; precipitation decidedly below normal. Plowing commenced about the 10th and seeding about the 15th, and were well advanced in certain counties by the close of the month. Range grass made fair growth by the third week and cattle and sheep noticeably improved. Winter wheat and rye made good start and early sown spring wheat and oats were coming up during the last week.—*R. F. Young.*

Nebraska.—Low temperature and generally deficient precipitation retarded growth. The soil was generally in good condition, and spring wheat and oats were sown early and plowing for corn progressed unusually fast. Very little corn was planted. Winter wheat started nicely, except in western counties, where it was damaged by dry weather. Grass started very slowly. Fruit trees were in blossom and very promising the last week, and oats and spring wheat were up nicely at close of month.—*G. A. Loveland.*

Nevada.—Temperature and precipitation averaged below normal. Forepart of month mild and favorable for farming operations, latter part unseasonably cold with heavy frost, which damaged fruit buds in southern and western districts. Plowing and seeding progressed rapidly in all districts, but the weather during the latter part of the month was much too cold for germination and growth.—*J. H. Smith.*

New England.—Cold weather and heavy precipitation were very unfavorable to all farm operations, and also to crops, although grass and winter grain were generally in fairly good condition. The month closed with several days of pleasant weather, during which much plowing and some garden planting were done. The season was ten days to two weeks late. Excepting peaches, which were greatly damaged by the cold, fruit buds were reported in favorable condition. The maple sugar crop was good.—*J. W. Smith.*

New Jersey.—Low temperature and badly distributed rainfall greatly retarded work, germination, and growth. Frequent killing frosts occurred, the last for the month on the morning of the 23d, when ice formed in many places, but did no serious injury. At close of month the blossoming of fruit trees in southern and central sections was fully two weeks later than usual. In those sections the planting of potatoes and seeding of oats was completed before the month closed.—*Edward W. McGann.*

New Mexico.—The protracted drought remained practically unbroken, excepting in the extreme northeastern section. Stock suffered severely, and many cattle died on southern ranges. Early lambing almost a complete failure in many localities on account of the cold nights and lack of green grass for the ewes. Farm work generally remained at a standstill. Early fruits, as apricots, peaches, and cherries, suffered greatly from frosts, winds, and drought.—*R. M. Hardinge.*

New York.—Winter severe and spring unusually late. April cold and unseasonable and all farm work very backward. Wheat and rye suffered from the cold winter, and grass was considerably damaged. Peaches were largely killed and pears were damaged in places, but other fruit was considered safe April 30. The season was favorable for making maple sugar.—*R. G. Allen.*

North Carolina.—The month was very cool and dry. Farm work progressed rapidly, but germination and growth were slow. The frequent

SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, APRIL, 1904.

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.								Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	60.0	— 3.4	Thomasville	89	1	Livingston	28	5	2.22	—2.17	Oneonto	4.65	Camp Hill	0.43
			Newbern	89	24									
Arizona	61.9	0.0	Gila Bend	108	26	Grand Canyon	10	1	0.01	—0.30	Flagstaff	0.11	43 stations	0.00
Arkansas	58.6	— 4.8	Jonesboro	89	23	Pond	24	10	3.88	—0.35	Amity	7.94	Dardanelle	1.64
			Ozark	89	23									
California	57.2	— 0.5	Indio	110	26	Bodie	— 4	20	2.18	+0.29	Pino Grande	9.25	8 stations	0.00
Colorado	44.5	+ 0.7	Delta	90	27	Whitepine	— 3	7	1.03	—0.45	Yuma	3.37	Conejos	0.09
Florida	68.3	— 0.4	Ocala	95	2	Macclenny	38	14	1.71	—0.64	Eustis	3.88	Marco	0.36
						Marianna	38	14						
						Middleburg	38	9						
Georgia	59.7	— 3.6	Mauzy	93	16	Clayton	23	5	1.63	—1.96	Diamond, Rome	3.18	Savannah	0.35
Idaho	46.0	.....	Blue Lakes	91	13	Lake, Paris, Soldier	0	1	1.24	.....	Grangeville	2.40	Albion	0.25
Illinois	46.7	— 5.4	Bushnell	87	23	Dixon	13	21	3.76	+0.50	Carrollton	7.34	Martinsville	0.95
Indiana	46.8	— 5.3	Rome	87	23	Angola, Markle	18	20	3.32	+0.14	Greencastle	5.87	La Porte	1.37
						South Bend	18	20						
Iowa	41.1	— 5.2	Forest City	86	23	Primghar	13	11	3.63	+0.74	St. Charles	8.97	Elkader	1.52
			Sigourney	86	22									
Kansas	50.9	— 4.9	Englewood	92	13, 21	Larned	15	8	3.61	+0.91	Fort Scott	10.34	Ulysses	0.60
Kentucky	50.8	— 5.2	Cadiz	85	23	Middlesboro	16	21	2.83	—0.97	Catlettsburg	4.30	Highbridge	1.90
Louisiana	62.9	— 1.9	St. Francisville	92	20	Robeline	30	17	3.05	—1.47	Oxford	6.45	Port Eads	1.15
			Schriever	92	21									
Maryland and Delaware	49.1	— 2.7	Cambridge, Md	87	25	Deer Park, Md	10	4	2.46	—0.95	Denton, Md	4.10	McDonogh, Md	1.29
Michigan	38.1	— 5.3	Berrien Springs	83	23	Thomaston	— 8	3	2.10	—0.15	Arbela	4.71	Chatham	0.49
Minnesota	38.8	— 4.8	Winona	82	30	Tower	3	1	1.72	—0.73	Moorhead	4.62	Milaca	0.24
Mississippi	61.2	— 3.5	McNeill	90	18	Ripley	30	4, 13	2.75	—1.54	Hazlehurst	6.35	Columbia	0.80
Missouri	49.0	— 6.4	Birchtree	84	23	Louisiana	19	21	5.75	+1.97	Nevada	11.03	Mineralspring	2.25
Montana	44.9	+ 1.0	Lodgegrass, Poplar	88	28	Chinook	— 3	1	0.66	—0.52	Red Lodge	2.43	Plains	T.
Nebraska	45.8	— 3.7	Lynch, West Point	84	29, 30	North Loup	6	16	2.00	—0.51	Pawnee City	7.37	Kennedy	0.15
			Santee	84	30									
Nevada	45.4	— 0.6	Martin's Ranch	97	11	Eureka, Potts	10	1	0.66	—0.16	Austin	1.98	Wadsworth	0.00
						Hamilton	10	19						
						Geyser	10	24						
New England*	41.5	— 1.8	Hartford, Conn	78	25	Van Buren, Me	0	4	5.68	+2.68	Kingston, R. I	9.70	Fort Fairfield, Me	1.35
New Jersey	46.7	— 2.7	Bridgeton	85	25	Layton	16	4	3.42	—0.01	Newark	4.71	Clayton	2.00
New Mexico	53.3	+ 1.5	San Marcial	97	7	Fort Union	14	7	0.15	—0.38	Eagle Rock Ranch	1.13	7 stations	0.00
New York	40.5	— 4.0	Primrose	78	25	Number Four	5	4	3.35	+0.55	Elba, Southampton	7.17	Ticonderoga	1.47
North Carolina	54.8	— 2.9	Tarboro	88	26	Linville	11	21	1.47	—2.35	Bryson City	3.42	Raleigh	0.29
North Dakota	37.4	— 4.0	Wishek	91	30	Milton	2	3	1.70	—0.17	Lisbon	4.18	Bottineau	0.13
Ohio	44.4	— 5.4	Sidney	81	23	Millport	7	14	3.53	+0.66	Wooster	6.59	Toledo, No. 2	1.29
Oklahoma and Indian Territories.	58.7	— 2.4	Mangum, Eldorado, Okla.	100	20	Cleo, Okla	23	16	2.82	—0.47	Cleo, Okla	5.06	Kenton, Okla	0.58
Oregon	51.3	+ 3.3	Alpha, Fairview	94	11	Lakeview	10	23	2.85	—0.48	Glenora	8.75	Butter Creek	0.30
Pennsylvania	44.7	— 3.3	Hanover	86	25	Claysville	9	14	3.45	—0.12	Parkers Landing	6.42	Shawmont	1.34
Porto Rico	74.4	.....	Manati	94	18	Cidra	50	26	5.10	.....	Perla b	12.73	Central Aguirre	1.31
South Carolina	59.2	— 3.2	Gillisonville	89	16	Spartanburg	21	5	1.34	—2.30	Liberty	2.45	Charleston	0.17
			Walterboro	89	2									
South Dakota	42.9	— 3.6	Cherry Creek	88	28	Hotch City, Howell	7	16	2.02	—0.75	Aberdeen	6.80	Cherry Creek	0.10
Tennessee	53.4	— 5.1	Dover	84	23	Springdale	17	21	3.26	—0.98	Covington	6.36	Charleston	1.60
Texas	66.3	— 1.1	Comstock	102	15	Tulia	28	9	2.98	+0.20	Galveston	11.04	4 stations	0.00
			Gatesville	102	7									
Utah	48.2	+ 1.0	Hite	94	12, 13	Loa	10	24	0.76	—0.26	Alpine	3.02	3 stations	T.
Virginia	51.4	— 2.8	McDowell, Newport News.	90	26	Hot Springs	11	3	2.32	—0.95	Hot Springs	4.95	Bedford City	0.62
Washington	50.8	+ 2.7	Centralia	92	12	Cusik (Usk), Twisp	17	1	2.19	—0.42	Clearwater	6.60	Sunnyside	0.23
West Virginia	47.7	— 3.1	Moorefield, Nuttallburg.	82	24	Powellton, Terra Alta.	12	4	3.15	—0.31	Powellton	5.71	Marlinton	1.12
Wisconsin	39.4	— 6.0	Brodhead	83	23	Hayward	— 6	16	1.86	—0.80	Medford	3.05	Florence	0.62
Wyoming	41.5	+ 1.4	Hyattville	85	27	Grand Canyon, Yellowstone Nat. Park.	—12	1	1.42	—0.48	Thermopolis	8.27	Fontenelle	0.05

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

frosts thinned the fruit, especially peaches, though apples were not hurt much, and injured truck to a minor extent. Preparations were made for a large crop of cotton. Planting corn became general and some was up. Tobacco plants were small and late. Wheat and oats improved somewhat, but need warmer weather and more rain.—*C. F. von Herrmann.*

North Dakota.—Unusually cool weather prevailed during the forepart of the month, accompanied about the 8th by a severe storm in all sections, except the central and western portions. The melting of this snow, together with that which was already on the ground, flooded most lowlands, making farm work impossible until near the close of the month.—*B. H. Bronson.*

Ohio.—Temperatures were decidedly below normal. Precipitation was somewhat in excess in the northern and middle sections and slightly deficient in southern portions. Excessive rainfall occurred on the 1st. Work was delayed and growth retarded. Wheat was injured by freezing. Winter rye improved. Seeding for oats was delayed. The weather was too cold for tobacco. Fruit prospects were generally satisfactory, although the outlook for peaches was poor.—*J. Warren Smith.*

Oklahoma and Indian Territories.—Cool weather and deficient precipitation retarded development of crops and caused a decline in cereals. Wheat made poor to fair growth, but was in poor condition, and a large area placed to other crops. Oats uneven stand and poor. Corn a fair stand and being cultivated. Cotton coming up to a fair stand. Kafir corn, millet, castor beans, and broom corn being planted. Alfalfa, range grass, fruit, and stock were doing well, but fruit was badly damaged by frosts.—*C. M. Strong.*

Oregon.—First half of month very favorable for all crops, latter half cool and showery. Fall wheat was healthy, well stooled, and growing nicely. Spring wheat, oats, and barley were coming up to good stands. Pastures and stock did well. Goat shearing completed, clip good. Sheep shearing well advanced, with average clip. Gardens were backward. Hops were thrifty. Cherries and Italian prunes were badly damaged in a few localities by frost; otherwise fruit prospect was excellent.—*Edward A. Beals.*

Pennsylvania.—The mean temperature was the lowest for any April in the history of the service (17 years). The precipitation was very unevenly distributed. Conditions were decidedly unfavorably to plowing, seeding, planting, and germination, and the month closed with farm

work and vegetation two or three weeks backward. The consensus of opinion was that a large acreage of winter grain had been killed and that all fruit had been more or less injured, and peaches seriously.—*T. F. Townsend.*

Porto Rico.—Weather generally favorable for all crops. Sugar making continued without interruption and the grade of juice obtained was generally satisfactory. Young canes were in excellent condition. Coffee trees continued blossoming; early blossoms badly injured by the heavy rains of March and the crop will be light. Rice, beans, corn, and cotton planted and some beans and corn harvested. Oranges became scarce. Pineapples and mangoes appeared in the markets. Pasturage was good.—*E. C. Thompson.*

South Carolina.—Steady low temperatures and a deficient rainfall were favorable for planting operations, which advanced farther than usual, but conditions were unfavorable for germination and growth, so that stands of corn, cotton, and rice were generally poor. Cotton planting was nearly finished, but only a small portion came up during the month. The normal development of truck, oats, wheat, and tobacco was retarded. Peaches, apples, plums, and other fruits were not affected.—*J. W. Bauer.*

South Dakota.—By the 30th the seeding of oats and spring wheat was finished in the southern and near completion in the middle counties, and wheat seeding was well advanced in the northern counties, with early sown grain coming up well and the medium late sown germinating favorably. Spelt and rye seeding was fairly well advanced and potato planting and gardening were begun. Grass was very backward, but by the close of the month afforded some grazing.—*S. W. Glenn.*

Tennessee.—The month was generally favorable for farm work, but the low temperature caused poor germination of seeds and slow growth of crops; however, wheat and spring oats improved greatly. Corn and cotton were mostly planted by the end of the month, but were coming up slowly; tobacco plants were small. Frosts during the first three weeks damaged garden crops and fruits, but there was a good prospect for apples, and in some localities peaches promised a fair crop.—*H. C. Bate.*

Texas.—Frequent cool waves occurred during the month, and on the morning of the 10th light frost was reported down to the coast region. The rainfall over the eastern half of the State was well distributed and sufficient to keep the ground in good condition; that over the western half was very light and afforded only temporary relief from the drought that had prevailed over that section for several months. The planting of cotton progressed rapidly and was nearly completed in the eastern half by the close of the month; good stands were generally secured, but the cool weather interfered with growth and the frost of the 10th did considerable damage to plants on lowlands. Corn made good growth and had received its first cultivation. Wheat, oats, barley, and rye made steady improvement, but were still much below the average condition in the western portion. Fall wheat and oats were heading. Rice sowing progressed rapidly and good stands were generally secured. Sugar cane made good growth. Hay and forage crops did well. The fruit crop was promising.—*L. H. Murdoch.*

Utah.—The temperature was slightly above normal, while precipitation was deficient. Farm work was backward until the last week when the weather was favorable for rapid progress. At the close of the month the seeding of spring wheat was well advanced. Beet planting was also under rapid headway. Fall wheat was doing well. Lucerne was generally in good condition and so was fruit. Ranges were good and cattle thriving. Sheep shearing was in progress with satisfactory clip.—*R. J. Hyatt.*

Virginia.—Crop conditions were not satisfactory. The weather was generally unseasonably cool; severe and general frosts in last decade did great injury to fruit bloom, especially peach, pear, plum, and cherry, and to young vines and berries. Preparation of land for spring crop was delayed, and gardens and pastures were later than usual. Winter wheat improved during the month and a considerable acreage of spring oats was seeded. Winter oats were in poor condition.—*Edward A. Evans.*

Washington.—The month was considerably above the average in warmth and scarcely as wet as the average April. Crops made no advancement, and no progress was made in farm work until the warm spell from the 8th to 18th, when all crops grew rapidly and plowing and seeding were rushed. The remainder of the month was showery, so that work was delayed and was too cool for rapid growth. At end of month fall wheat appeared to be in excellent condition.—*G. N. Salisbury.*

West Virginia.—Cold, cloudy, rainy weather prevailed during the month, and killing frosts were frequent. Vegetation made little progress, but plowing was pushed rapidly. At the close of the month, wheat and rye were improving somewhat, and meadows and pastures were making some growth; but little gardening had been done; stock was in fair condition, and had mostly been turned out. Although some early fruit was injured, the prospects for a good fruit crop were excellent.—*E. C. Vose.*

Wisconsin.—Cold and cloudy during first and second decades with rain and snow at frequent intervals, and a severe cold wave on the 16th; decidedly warmer weather during the third decade. Much spring grain was sown during the last week. Winter wheat and rye were injured by alternate freezing and thawing, but improved during latter part of month. Standard varieties of apples, plums, cherries, cranberries, and strawberries wintered well, but blackberries and raspberries, where unprotected, were badly killed.—*W. M. Wilson.*

Wyoming.—By the close of the month plowing and seeding were well advanced or completed over the earlier sections of the State, but hardly begun over the later sections. Grass had made good progress and the range was supporting stock over much of the State. Cattle and sheep were in excellent condition, and losses during winter were unusually light.—*W. S. Palmer.*

SPECIAL ARTICLES.

APPLICATION OF SALTS OF RADIUM TO THE STUDY OF ATMOSPHERIC ELECTRICITY.[1]

By TH. MOUREAUX, director of the observatory, Parc St. Maur.
[Translated by Miss R. A. Edwards.]

In current observations of atmospheric electricity, the value of the potential of the air is generally obtained by means of dropping water. This method, perfect in warm countries, is impracticable in our climate on account of the freezing of the water, the receiver, in many cases, being installed under the eaves of elevated buildings, in a place devoid of means of heating. Attempts have been made to protect the stem of the dropper from freezing, chiefly by means of a covering of wool, or by adding to the water a certain quantity of alcohol or of glycerine; but these means present rather serious difficulties in practise. In fact, the registering of variations of the potential is frequently interrupted in winter, at least during severe cold.

The discovery of the salts of radium by Professor and Mrs. Curie places in the hands of physicists a new method, applicable to all places and in all seasons. Professor Curie having had the kindness to place at our disposal some samples of salts of radium of different degrees of activity, we have successively executed a comparison between them and the water dropper now in use. The method adopted for these experiments is as follows: In a copper disk about four centimeters in diameter and two millimeters in thickness, Professor Curie hollowed out to a depth of half the disk's thickness a cavity 15 millimeters in diameter; at the bottom of this cavity he placed a thin sheet of asbestos, on which was placed a decigram of radium-bearing chloride of barium. A plate of aluminum about 1/10 millimeters in thickness was then carefully soldered to the copper disk, in such a manner as to hermetically seal the capsule thus formed. On the face of the disk opposite the aluminum plate was soldered a copper tube which fitted exactly the ordinary tube of the water reservoir at its free extremity. The value of the potential can then be ascertained as one wishes, either by means of radium or by means of the water dropper at two points as near as possible to each other.

Experiments were made at the observatory of Parc Saint-Maur during the months of March and April, 1903, with this apparatus. Three capsules were studied successively. In one, one of the first samples of radium obtained from Professor and Mrs. Curie in 1899 was used. Its radio-activity was not determined, but the experiment showed that the activity of this salt was not sufficient. In fact, the needle of the electrometer established equilibrium very slowly with the atmospheric potential. Rapid variations, for example, were considerably weakened; moreover, the portions of the registered curve indicated constantly a potential clearly less than that indicated by the water dropper; and, finally, the return to zero was extremely slow. The second capsule contained radium-bearing chloride of barium, of activity 5000 times that of uranium. The curves obtained with this second sample did not differ materially from the preceding; they showed that here also the radio-activity was insufficient to guarantee that the registered values were equal to the real value of the potential near the capsule, and, on account of the slowness of the move-

[1] Annuaire de la Société Météorologique de France, Janvier, 1904, pp. 9–11.

ment of the needle of the electrometer, the details of the variations were equally reduced or altogether suppressed. Finally, the third capsule contained a decigramme of radium-bearing chloride of barium 30,000 times that of uranium. This radio-active power gave to the observed variations of the potential a sensitiveness as great as did the water dropper.

This third capsule was placed at the extremity of the tube, and the potential was taken alternately, during regular intervals, with the radium and the water dropper. In both cases the state of equilibrium and the return to zero were reached with equal rapidity; the same details were obtained with radium and with the water dropper, and at the moment when either apparatus was substituted for the other the agreement of the curves was perfect. The experiment was prolonged during several days, and gave constantly the same results; the capsule has consequently been put into active use; tests made from time to time have shown that the radium bearing salt loses none of its energy. But after eight months of exposure to the air it has been ascertained that the aluminum plate alters with the weather, under the influence of the radiations from the radium, and does not sufficiently protect the salt from changes of humidity. Professor Curie thought that a good varnish would probably suffice to protect the contents of the capsule from variations of atmospheric humidity; the experiment was made by spreading over the capsule several thicknesses of special varnish used at carriage factories for fine carriages. This varnish, almost impervious to changes of weather, assures a perfect and durable protection. Moreover, it has the advantage of offering less resistance than the aluminum plate to the radiations of radium, so that by doing away with this plate, in some form of capsule that may be finally adopted, a salt of less radio-activity, obtainable at a more reasonable price, could probably be used. Experiments are continuing in this line under the direction of Professor Curie.

This process possesses then all the requirements for efficiency, providing the salt is endowed with proper radio-activity and that it is perfectly protected from the influence of humidity.

The advantages in using salts of radium in observations of atmospheric electricity are numerous. We will cite the principal ones: The constancy of the height above ground of the point where the potential is taken; facility in raising this point so as to be above buildings, trees, and, in a word, above all kinds of obstacles that by modifying the shape of equipotential curves greatly impair their value as useful observations; the total suppression of breaks resulting from stoppage in dropping, due to impurities in the water or to freezing temperature; less frequent personal attention; the abolishing of the water reservoir and, consequently, considerable diminution in the expense of installation and of maintenance; extension of the method to the polar regions, where the study of these phenomena is particularly interesting.

In a letter describing his apparatus more fully, M. Moureaux says:

The apparatus with which I made these observations, and which was constructed for me by Professor Curie himself, is described briefly in the Annuaire of the Meteorological Society of France. The capsule, as it is called therein, is represented in section in the accompanying figure.

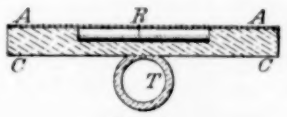

FIG. 1.

CC is a disk 32 millimeters in diameter and 3 millimeters in thickness. It is cut away to a depth of one-half its thickness at *R*, leaving a circular cavity 15 millimeters in diameter. On the opposite side of *T* there is soldered a tube of copper, which is held in place by friction at any point along the tube that carries the water used in the water-dropping collector. At the base of the cavity there is placed a thin sheet of the finest sort of asbestos, known as amianthus or earth flax, which is represented by the heavy black line. This is intended to keep the radium salt in place, since on this sheet of amianthus there is placed one decigram of the radio-active chloride of barium, having a strength of 30,000, and represented on the diagram by the dots at *R*. Finally, the salt of radium was at first covered with a plate of aluminum 0.1 millimeter in thickness and represented by the sectional line *A A*, which was soldered to the copper. But, after some months of exposure, this plate of aluminum was attacked by the emanations from the radium and pierced by numerous holes, through which the atmospheric moisture could penetrate. In order to remedy this inconvenience, and with the advice of Professor Curie, after having completely dried the capsule, I covered the perforated plate of aluminum with several layers of an excellent varnish, resisting all bad weather.

This operation was performed in December, and since that epoch the apparatus has operated with the greatest regularity. It is, therefore, probable that the plate of aluminum ought to be suppressed in the construction of a new apparatus. You will find the reproduction of two of my daily curves in the Comptes Rendus of the Southport meeting of the International Meteorological Committee, pp. 64 and 65 of the French edition.

The application of radium to the determination of the electric potential at any point in the atmosphere was independently made by several persons; possibly it was first suggested by Prof. F. Exner of Vienna. It undoubtedly constitutes a most convenient substitute for the water dropper, the flame of burning gas, or the various forms of induction apparatus, and it will be worth while for those interested in the subject to look up its earlier bibliography and to ascertain the relative reliability of different methods.

Under date of April 9, Professor Rutherford suggests an improvement on Moureaux's method of exposing the radium and securing it from the influence of the weather, namely, "by inclosing the radium preparation hermetically in a very small thin walled bulb which allows most of the β rays to escape. If the outside of the bulb is silvered and connected with the electrometer, it would act rapidly and should be quite independent of all atmospheric troubles."

As to the relative reliability of various collectors, Linke has shown that the water dropper gives different results or varies in its sensitiveness in proportion to the pressure under which the stream of water is flowing; the greater the pressure the greater the number of small drops formed per second and therefore the greater the sensitiveness. He has also shown that in using a radio-active substance as collector the sensitiveness increases with the increase in the velocity of the wind and the consequent convection of the emanations. The following are a few references to the recent literature of the subject:

Benndorf. Über ein mechanisch registrierendes Elektrometer für luftelektrische Messungen. Pp. 487–512. Vienna Sitzungsberichte. Vol. 111. Abtheilung 2a. 1902.

Conrad, Victor. Beiträge zur Kenntniss der atmosphärischen Elektricität. No. 7. Über die entladende Wirkung verschiedener Elektroden. Sitzungsberichte Akad. Wien. Vol. 111. Pp. 333–340 (session of February 20, 1902).

Ebert, H. Über electrische Messungen im Luftballon. Beiträge zur Geophysik, Leipzig. 1903. Band 6. Heft 1. Pp. 66–86.

Henning, F. Vergleichende Messungen des elektrischen Potentiales mittels der Flamme und eines aus radioactiver Substanz bestehenden Collectors. (Contributed February 7, 1902.) Ann. Phys. 4th series. 1902. Vol. 7. Pp. 893–904.

Linke, F. Über Messungen von Potentialdifferenzen mittels Kollektoren unter besonderer Berücksichtigung von radioaktiven Substanzen. Physikalische Zeitschrift. 4. Jahrgang. Oct. 1, 1903. No. 25. Pp. 661–664. (Dated September 15, 1903.)—ED.

STUDIES ON THE CIRCULATION OF THE ATMOSPHERES OF THE SUN AND OF THE EARTH.

By Prof. FRANK H. BIGELOW.

V.—RESULTS OF THE NEPHOSCOPE OBSERVATIONS IN THE WEST INDIES DURING THE YEARS 1899–1903.

METHODS OF OBSERVATION AND REDUCTION.

The observers of the United States Weather Bureau occupied eleven stations in the West Indies during the years 1899–1903, and the opportunity was utilized to make a survey of the motions of the atmosphere in that region of the Tropics by means of nephoscopes.

The instruments were of the Marvin pattern, and the method of observation, to obtain the azimuth and velocity of motion, was identical with that described in the Report of the Chief of the Weather Bureau, 1898–99, Vol. II, chapter 2. The reductions were, however, carried out more perfectly than in any previous research of the kind in the following manner: (1) The three readings at each observation were reduced to a mean azimuth and velocity, for entry on the computing sheets. (2) Each vector V, φ was separated into its rectangular components, $+S, +E$, where S is positive southward on the meridian, and E is positive eastward on the parallel of latitude. (3) The algebraic sum of each set of components was then taken from month to month, and the groups for corresponding months during the years 1899–1903 combined. (4) These sums were divided by the number of observations to obtain the mean velocity component per observation. The observations were taken for two years in the afternoon hours, and for the other two years in the forenoon hours, so that the diurnal variation was practically eliminated by putting the entire data for each of the twelve months in a single summation. (5) These mean ordinates were plotted month by month for the nine cloud levels, and average curves were drawn through them. In spite of the fact that the number of observations is large, when taken as a whole, yet, when subdivided among so many strata, there is more scattering of the ordinate points in certain levels than is desirable. The average curves approximate the normal components which would be derived from a very much more extensive series of observations. The full report will contain the observed ordinates and those obtained by graphical adjustment. (6) The resultant polar coordinates V, φ were then computed from the rectangular coordinates. Up to this point the numerical data had been carried forward in the number of millimeters passed over in twenty-five seconds on the scale of the nephoscope. (7) These numbers were now reduced to velocities in meters per second, by multiplying them by the factor $\frac{1}{5} H$, where H is the adopted height of the cloud stratum. The values of H were adopted from the Washington cloud heights, after considering the heights obtained at Manila during the same cloud year, 1896–97. These velocities and azimuths were transferred to charts, drawn to the scale, 1 millimeter = 1 meter per second. In preparing these charts for publication in the MONTHLY WEATHER REVIEW, the original scale has been reduced to 0.6 millimeter = 1 meter per second, as shown by the "velocity scale in meters per second" at the bottom of each chart of the sets Chart XII and XIII, the scale of Chart XIV being unchanged.

CHARTS OF THE RESULTING VELOCITIES AND DIRECTIONS OF MOTION FOR THE WEST INDIES.

The vectors (V, φ) have been plotted for each station, so that the mutual relations of the resulting motions can be properly compared and studied. There are several remarks to be made about the observations themselves. At Willemstad the observers have frequently misnamed the *cumulus* clouds as *cumulo-stratus*. This becomes apparent on plotting the vectors. The angles are correct, but the length of the arrows is too great. I have accordingly interpreted the values of V_1 and V under strato-cumulus as belonging to the cumulus level, and have used the reduction factor 0.5 instead of 0.9 in drawing the charts.

At Bridgetown the vector systems of the alto-stratus and the cirro-cumulus levels have apparently been interchanged. As they now stand at Bridgetown they are inconsistent with the flow of air as determined at Basseterre, Roseau, Port of Spain, and Willemstad; but if they are transposed, then there is harmony. The observation sheets indicate that the observers have an unusually large number of cirro-cumulus entries and comparatively few alto-stratus, so that apparently they were accustomed to name many alto-stratus clouds as cirro-cumulus clouds. It is not easy to secure identical estimates of cloud forms at so many independent stations as we have used, and these few instances of apparent discrepancies are gratifying evidence of the general excellence of the results in other respects.

On comparing the charts here presented with those published by Prof. H. H. Hildebrandsson for the international committee, it appears that he has computed only the angle of the azimuth of motion without the velocity, and that the same schematic velocity is entered throughout the year. Apparently the actual velocities have not been computed for that report at any station. The importance of having the velocity as well as the direction of motion is evident, and this is emphasized by examining the great variations between the summer and the winter velocities and between those at the different cloud levels of each station of the West Indies. Comparing the Hildebrandsson and the Bigelow results for Havana (Plate VII, International Report), with fig. 22, Chart XII A, the azimuth directions are not in agreement in the autumn; comparing those for the Antilles (Plate III, International Report), with figs. 28, 29, 30, Charts XII B, and XII C, Basseterre, Roseau, and Bridgetown, the legend "Nuages superieurs" should apparently be changed to "Nuages intermediaries" or "Nuages inferieurs."

The vectors of the West Indian stations have been plotted in three forms: The first, Charts XII A, XII B, XII C, figs. 22 to 32, wherein the vectors of the same month throughout the nine levels terminate on the same vertical line; the second, Charts XIII A, XIII B, XIII C, figs, 33 to 43, wherein the vectors for June terminate on the same vertical line and the others in succession, so as to form a continuous broken line; the third, Charts XIV A, XIV B, XIV C, figs. 44 to 61, showing approximate normal vectors for winter and summer. The first enables us to study the movements simultaneously occurring in a given month from the surface wind to the cirrus level, and from this many important conclusions can be drawn. The second makes more distinct the general course of the movement in the several strata throughout the year, and especially the nature of the currents that depend upon the forces producing the westward drift of the lower levels and the eastward drift of the upper levels, together with the transition levels between them. The third system of charts is a composite of the mean winter and the mean summer systems, respectively, some of the minor irregularities being rectified in the adopted vectors. January and February constitute the middle of the winter group, while July and August are at the middle of the summer group. In adopting these vectors regard was had to the most probable balanced system which is indicated by the entire set of vectors. If the reader has doubts as to the accuracy of these final results, the original material of the third set of charts is to be found in the first and second sets, or in tables from which all the charts have been plotted, which will appear in the full report. Numerous studies in the dynamic meteorology of the Tropics are now practicable for the first time, but as it will require much careful labor to execute them, only some general remarks are required in this place.

THE ARCH SPANNING THE TROPICS, WHICH DIVIDES THE EASTWARD DRIFT FROM THE WESTWARD DRIFT OF THE GENERAL CIRCULATION.

The general theory of the circulation of the atmosphere shows that in the temperate zones of the Northern and the Southern hemispheres there is a strong prevailing eastward component producing an eastward drift, while in the Tropics there is a prevailing westward component causing a westward drift. The tropical westward drift is, however, limited in altitude, and at a certain elevation the drift reverses from a westward to an eastward direction. The position of the curve which separates the eastward from the westward drift varies with the season of the year. When the sun is far to the south and the northern winter prevails, the arched curve must be skewed to the south, and when the sun is far to the north and the northern summer prevails the arch is skewed toward the north. This is on the assumption that the foot of the arch rests on nearly the same latitude in winter and summer at any given region of the earth. The high pressure belt, which fixes the position of the arch on the surface of the earth, for the eastern portion of the United States lies somewhere between +30° and +35° north latitude, and crosses the Atlantic coast at about Florida and South Carolina. It is desirable to determine from our observations its exact location, but as this is of subordinate importance for our immediate purpose it can be passed over in this connection. Further accounts of the mathematical significance of the tropical discontinuous surface between the prevailing eastward and westward drifts may be found by consulting the full report, and my paper in the MONTHLY WEATHER REVIEW, January, 1904, Vol. XXXII, p. 15.

One special purpose of the West Indian nephoscope survey for 1899–1903 was to determine this surface of separation in the higher levels, and its variation with the season of the year. The velocities and direction of motion on either side of it, and the numerous meteorological inferences that can be drawn from these conditions, made the work of primary importance in the development of the dynamics of the atmosphere. The series of Charts, XII A to XIV C, figs. 22 to 61, are now available for this purpose. The twelve months, as observed, may be taken in two groups, of which the winter group is distributed about January and February as the central months, and the summer group about July and August. If there had been simultaneous observations in the Southern Hemisphere at latitudes corresponding to those that were occupied by the West Indian stations in the Northern Hemisphere, we should then have the data applying simultaneously to the entire tropic zone. The same result can be closely approximated by treating the winter group as representing the north tropical zone, and the summer group as representing the south tropical zone, during the northern winter. Hence, by using the results from November to April in the northern latitudes, and assuming that during this period the conditions observed for the northern latitudes during May to October then prevailed in the southern latitudes, the synchronous action of the circulation can be found for the northern winter throughout the Tropics. By reversing this process the corresponding results for the northern summer are obtained.

An inspection of the vectors of motion in the winter months shows that for Havana, Cienfuegos, and Santiago, Cuba, with mean latitude 22°, the reversal is about midway between the cumulo-stratus and alto-cumulus levels, or at approximately 3500 meters above the sea level. At Kingston, Santo Domingo, San Juan, Basseterre, Roseau, and Bridgetown, having the mean latitude of 17°, the reversal is apparently in or above the alto-stratus level, or about 6400 meters elevation. At Willemstad and Port of Spain, with mean latitude of 12°, the reversal is in the cirro-cumulus level, at about 8000 meters elevation. This is shown on the northern winter branch of fig. 62, "Mean altitudes at which the westward drift reverses to the eastward drift in the Tropics."

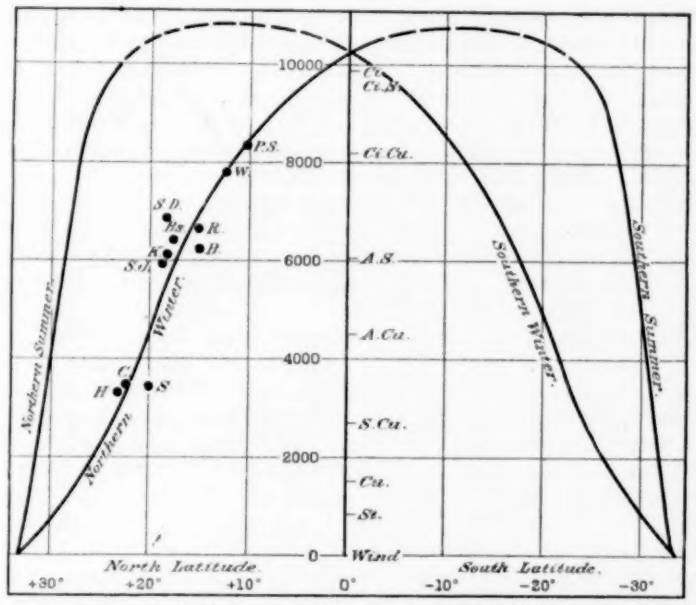

FIG. 62.—Mean altitudes at which the westward drift reverses to the eastward drift in the Tropics.

An examination of the vectors for the summer group of months indicates that generally there is a tendency to reversal in the cirrus and cirro-stratus levels, at about 10,000 meters elevation. This, however, is not definitive, and I have indicated the probable top of the arch in a broken line rather than to positively assign the limit. The summer westward circulation is very feeble throughout the column from the sea level at least to the 10,000-meter level, and it may be that it extends even to a higher level over the effective thermal equator, which lags about forty-five days behind the position of the sun in latitude. In the very complex circulation actually existing in the Tropics it is not possible to make very exact statements regarding such a loosely defined boundary as that which really separates the eastward and westward currents of the atmosphere underneath the sun. The calms of the thermal equator move northward and southward with the sun, and apparently the westward drift extends upward unbroken to about six miles, though at that level there are evidences that the eastward drift is making itself felt. The east and west currents play against each other at these high levels in a somewhat irregular manner.

THE LEVELS OF MAXIMUM HORIZONTAL VELOCITY.

An examination of Charts XIII A, XIII B, XIII C, figs. 33 to 43, brings out clearly the levels of the maximum horizontal currents. The circulation generally increases in westward velocity from the surface to the strato-cumulus level, then falls off to a minimum in the alto-stratus level, where the direction is irregular, and then increases to a maximum eastward velocity in the cirrus level. The stations of Cienfuegos and Santiago, Cuba, together with Kingston and Santo Domingo, give relatively small resultant velocities in the lower levels, from wind to cumulus, as compared with Havana, San Juan, and the southeastern group, Basseterre, Roseau, Bridgetown, Port of Spain, and Willemstad. The former group of stations develop greater irregularity in their azimuth directions than do the latter group, and consequently their resultants are much diminished in magnitude. This probably indicates some action of the continental mass of North America in disturbing the westward drift, which prevails steadily in the Windward Islands, and in changing its general direction from the southeast, which is the natural flow from the trades, to the northeast in that region. The strato-cumulus level in the more eastern stations has a powerful westward current, which falls off decidedly in the vicinity of Cuba. On the other hand the north-

eastward or eastward velocity in the three upper levels—cirro-cumulus, cirro-stratus, and cirrus—is at a maximum over the Cuban stations, and tends to diminish toward the southeast; that is, from the Antilles to Port of Spain. The trade from the southeast holds quite uniformly in the lower levels of the eastern group of stations, and the northeastward upper trade prevails in the upper levels of the western group. Between the lower and the upper levels there is a region of transition whose nature is quite clearly indicated. At Port of Spain the southeast trade prevails throughout the year with maximum in the cumulo-stratus level, diminishing and partially reversing in the cirro-stratus and cirrus levels. At Willemstad, Bridgetown, and Roseau there is an exclusively northern component in the alto-cumulus and alto-stratus levels. At Basseterre and San Juan this component becomes northwestward or shows signs of reversing. At Kingston and Santiago the azimuths are irregular and the velocities small, and at Cienfugos and Havana the eastward drift practically dominates. Beyond these statements it is not very safe to go at present. The circulation is complex and depends largely upon the relation of the Atlantic high area, belonging to the general high pressure belt of the Northern Hemisphere, to the adjacent continents. The normal system seems to be like that of Willemstad, Bridgetown as corrected, and Roseau, where the movements from the southeast in the lower levels change to movements from the south in the middle levels and from the southwest in the higher levels. The southwest antitrades are conspicuous over Cuba, but they become west and even northwest antitrades over San Juan and the Windward Islands. One is surprised to find that the southeast trades prevail so steadily in the northern zone, winter and summer, even up to latitude +17°, including Port of Spain, Willemstad, Bridgetown, Roseau, Basseterre, and San Juan. It is evidently of primary importance that meteorologists should extend this nephoscope survey to the Azores, Ascension Island, St. Helena, the South American Continent, Central America, and Mexico. The entire circulation of the atmosphere can thus be carefully determined by means of the method here illustrated.

THE WINTER AND THE SUMMER CIRCULATIONS.

At a glance the great contrast between the motions of the air in winter and summer is apparent. Over Havana the northeastward velocities are above 30 meters per second in winter, and in the summer they become about five meters per second and are directed westward. The summer vectors on Chart XIII A, XIII B, and XIII C form an irregular broken line which in some cases become a very good loop. This looping or tangle in the line is quite characteristic of the summer vectors in the middle levels at Havana, Cienfuegos, Santiago, Kingston, San Juan, Basseterre, and of the vectors in the high levels at Roseau, Bridgetown, Port of Spain, and Willemstad. These loops and tangles sometimes make it difficult to determine from the original observations what is the true mean curve to be drawn, because the ordinates are quite scattering and irregular in the middle cloud levels. In the lower and higher levels there was little difficulty experienced from this cause in drawing the mean lines. As a general principle none of the broad statements which meteorologists have been accustomed to make regarding the trade-wind system seems to hold over a very large region. The changes from one locality to another are numerous and important, showing that the circulation of the Tropics is really very much localized. There exists no system of cyclones and anticyclones to disturb the general circulation, but this circulation is itself much more complicated than it is in the temperate zone. The dynamics of the two systems are very different, and depend upon a complex distribution of temperatures and pressures. Every effort should be made to determine what these are before resorting to analytic discussions, which will be of little permanent value until all the principal facts are known.

THE CAUSE OF THE WEST INDIAN HURRICANES.

The hurricanes which devastate the southeastern districts of the United States in the months from July to October originate in the West Indian region, and, as much conjectural writing has been published in order to account for them, it is important to throw what light is possible upon the subject. In the complex circulation shown to exist over the Carribean Sea, it is easy to suppose that gyratory local circulations can be set up which will develop into cyclonic action. The summer circulation is irregular, as befits a belt of calms such as prevail in the doldrums, or it has a feeble westward direction. In the winter this motion has become powerfully eastward in the upper levels, in consequence of the overspreading of the cold sheet of air from the temperate zone, which is controlled by the eastward drift of higher latitudes. In the autumn, especially in September, a marked change takes place, by which the stagnant or westward moving air is sharply propelled eastward. This is seen by examining the months of August, September, and October, in the alto-stratus and the higher levels on Charts XIII A, XIII B, XIII C, figs. 33, 34, 35, 38, 39, 40, and 41, for Havana, Cienfuegos, Santiago, San Juan, Basseterre, Roseau, and Bridgetown. This indicates the locality where hurricanes are especially generated, and agrees with otherwise well known facts. They seldom occur as far south as Port of Spain and Willemstad, but at these stations there is no indication of a sharp reversal in the cloud region. *The levels from alto-stratus to cirrus, from four to six miles high, are those chiefly concerned in causing the hurricane formation.* The lower levels do not have the same reversal currents, but their vectors are very steadily directed from the southeast to the northwest throughout this season of the year. A hurricane is built up on exactly the same mechanical principle as a tornado, namely, by the conflict of two currents flowing together from different directions and having different temperatures, only the hurricane is much deeper than the tornado, the hurricane forming a tube from four to six miles long, while the tornado tube seldom exceeds one mile in length. In the tornadoes of the United States the cool wind from the northwest flows against and over the warm current from the south or southeast as they meet in the central valleys. Between them, at the height of about one mile, a vortex tube is formed, which, by its gyratory action, extends downward through the lower strata, which latter must be in a more or less quiescent state or else drifting slowly forward from top to bottom. In the case of the hurricane in the high levels we have the cool eastward drift of autumn strengthening and spreading into the tropic zone, with a northeastward or eastward current, as shown at Havana, Cienfuegos, Santiago, San Juan, Basseterre, Roseau, and Bridgetown, Charts XIII A, XIII B, and XIII C. This meets the southeast trade with currents moving northwestward, as shown at Willemstad and Port of Spain, Charts XIII C, figs. 42 and 43, and between them a gyration is set up which penetrates downward four to six miles, and so produces a vortex tube of large dimensions and great power at the surface, such as hurricanes exhibit. This conclusion is an exact agreement with the results obtained in the Report of the Chief of the Weather Bureau, 1898–99, vol. 2, as given on chart 35 for the tropical hurricane and described on page 457. It was there shown that the vectors of motion in the cirrus level require the existence of a vortex tube at least five miles long. The usual drift of hurricanes from the place of generation is at first westward or northwestward, and this is because they are carried along with the prevailing currents in the lower and middle levels. It seems then that hurricanes build up in the higher levels by the counterflow of currents there prevailing, that they penetrate through four to six miles of lower strata to the surface, and are borne along westward by entanglement in the lower currents through which they penetrate. When these change their direction to the northward and northeast-

ward the hurricane track recurves with them. On the other hand the hurricane itself disappears in higher latitudes and is transformed into a shallow cyclone, because there the countercurrent flow in the higher levels ceases. These conclusions can be further illustrated by reference to Charts XIV A, XIV B, and XIV C, mentioned above.

APPROXIMATE NORMAL CIRCULATION IN THE WEST INDIES DURING THE WINTER AND SUMMER, RESPECTIVELY.

On Charts XIV A, XIV B, XIV C, figs. 44 to 61, which show the average normal circulation in the West Indian district of the Tropics, special attention is directed to the vectors in the four upper levels—alto-stratus, cirro-cumulus, cirro-stratus, and cirrus—for the summer months, figs. 44 to 52. These charts were drawn by inspecting all the available data from the eleven stations and carefully determining the most probable mean vectors that would make a natural, well-balanced system, wherein irregularities due to imperfect observations would be rectified. A comparison with the vectors of Charts XII A, XII B, and XII C, shows that the changes which have been introduced are all of a minor nature, and it is supposed that a larger number of observations with the nephoscopes would produce a system of vectors very closely approximating those here adopted. In the lower levels, from the surface wind up to and including the alto-cumulus level, the currents are similar, except that in the strato-cumulus level the velocity is at a maximum. From this level it diminishes both upward and downward.

It should be remembered that in discussing the nephoscope observations of 1896–97 for the strictly cyclonic and anticyclonic components in the circulation of the middle latitudes, we reached the same result regarding the prevailing level of maximum velocity, namely, that the maximum velocity is in the strato-cumulus level. Compare chart 68, page 625, Report of the Chief of the Weather Bureau, 1898–99, Vol. II.

In the upper levels of the Tropics, on the other hand, a new circulation is prevailing, which is peculiarly interesting in connection with the causes that generate hurricanes. Instead of one single westward drift, as in the five lower levels, there exist two countercurrents in the four upper levels. The western group of stations—Havana, Cienfuegos, Santiago, and Kingston—have their vectors pointing southward; the eastern group of stations—that is, Santo Domingo, San Juan, Basseterre, Roseau, Bridgetown, Port of Spain, and Willemstad—have vectors pointing generally northward. Between them there is a distinct region of counterflow, and, consequently, an area of low pressure. If we assume that in the upper strata, where the mechanical friction is a very small quantity, and where the internal mixing from local minor cyclones is negligible, the vectors are directed nearly parallel to the isobars, then we can easily construct their configuration, though we can not assign numerical values to them without further investigations. On the eastern side there is a high area, which is a portion of the western end of the prevailing Atlantic high pressure. On the western side there is another high pressure area, whose origin is not so easy to understand. Over the North American Continent in summer the heated surface conditions produce a general low pressure area in the lower strata, and simultaneously a high pressure area in the upper strata. It is very likely that the western high pressure in the upper strata over the West Indies is really the southern extension of the continental high pressure area prevailing in summer over the United States. Some further computations on our nephoscope observations in the United States will be required to determine the exact facts.

Between these two high pressure areas in the West Indies there exists a low pressure area, with countercurrents on either side, so that all the conditions are present that are needed to produce a *cyclone in the upper strata*. If the prevailing pressures and currents become intensified at any time, the high-level cyclone is strengthened, and it then penetrates with its large vortex tube to the surface as a regular hurricane. The entire circulating structure is borne along northwestward in the prevailing drift of the *lower* levels till it recurves in the southeastern part of the United States. It is evident that the locality of the formation of the center of cyclonic motion may shift eastward and westward over the West Indian region, depending upon the state of the atmosphere at the time, the position of the two great high pressure areas, and the conflicting currents in action. The normal type here produced is in reality made up of numerous fluctuations on either side of the mean. In forecasting for hurricane conditions it becomes necessary to watch carefully the motions of the four upper cloud levels, in order to learn the practical signs foreshadowing such a hurricane condition.

On Charts XIV B, XIV C, figs. 53 to 61, "Normal vectors for winter," the interest is of a different character from that explained in connection with the summer type. Here it is the reversal from the westward drift of the lower strata to the eastward drift of the upper strata. From the surface up to and including the strato-cumulus level the configuration is generally the same throughout the West Indian region, Then the reversal vectors first set in at the western stations, Havana, Cienfuegos, Santiago, in the alto-cumulus and alto-stratus levels; the other stations become involved later in the higher cirro-cumulus, cirro-stratus, and cirrus levels, where the regular antitrades prevail. The azimuths of the higher vectors show that the northward component nearly vanishes in the cirrus level over the eastern stations. It will be necessary for meteorologists to outline the eastern portions of the Atlantic high area in the levels up to 6 miles before executing conclusive discussions of the important dynamic problems suggested by these vectors.

THE MEASUREMENT AND UTILIZATION OF FOG.

By PERCY LEONARD, dated Point Loma Homestead, San Diego, Cal., April 12, 1904.

Seeing that the prevalence of fog here in the early summer is a very great help to vegetation, but that only a very small part of this gets into the rain gage, it seems a pity that our climate does not get the credit of this moisture in the precipitation records. Why should not an instrument be made, to imitate, to some extent at least, the action of the leaves and twigs of trees, and arrest the passing fog particles and make them render an account of themselves in the measuring tube?

I would suggest a wire framework of the same area as the rain gage, and say one foot high and made to fit on the rain gage. This wire-work cylinder to be crossed and recrossed with some durable filaments (e. g. horsehair) dividing up the cubic content into cubes of one-half an inch or less.

From a day of drifting fog I am convinced a great deal of water would be intercepted and deposited in the measuring tube.

Perhaps it might not answer to make the fog depositor a permanent extension of the rain gage, as it might interfere with its function as a measurer of legitimate rainfall. In this case perhaps it might form a separate instrument and its data be entered in a column by themselves.

A simple cylinder of very fine meshed wire gage of the same diameter as the rain gage to fit on the top might be better than the horsehair-crossed space, because I imagine that this would not interfere at all with its functions as a rain gage pure and simple.

If such fog depositors were used throughout the country the comparison of the returns would be interesting, and this much abused "arid section" so called, would make a very respectable showing of fog deposit that would level up to an appreciable degree its total precipitation to that of districts with a larger rainfall.

It must occur to everyone who reads the above article that

the proposed wire screen to catch the fog is not an exact equivalent to the leaves and twigs of a given plant, and the relation between the catch of the screen and the catch of the natural plant must be an entirely uncertain matter, unless we can first, by special investigation, determine the ratio of the catches in the two cases. Moreover, this ratio must necessarily be an extremely variable quantity, depending on the velocity of the wind at the two locations and on the variations in the leaf surface as it increases and diminishes with the phenological season. Moreover, the surface will vary from year to year as the plant increases in size. It would, therefore, be difficult, if not impossible, to argue from the catch of a screen up to the catch of an orchard of trees. The rain gage tells us that there has been a half inch of rainfall during a dry month in the shape of drops that descended with sufficient rapidity and in sufficient quantity to sink into and really wet the soil, so that the roots of the plants could absorb the water. On the other hand this "fog depositor" simply tells us how much it collected, and gives no positive information as to how much the leaves and stems collected or how much of the water fell to the ground in such a shape and such a place that the roots could utilize it.

In the MONTHLY WEATHER REVIEW for October, 1898, and March, 1899, will be found several notes on the utilization of fog, but nothing that aspires to be called the measurement of the quantity of fog, such as is suggested in the above communication from Mr. Leonard. From these articles it will be abundantly evident that the fog may be gathered and made useful to the plant, not so much by a system of horizontal wires or wire network, as by a system of inclined wires, rods, or stocks, each of which serves to lead the fog as fast as collected directly down to that part of the ground where the roots of the plants most need it; in fact, down to the bottom of holes in the ground where the water will be absorbed and stored up for the use of the plant, safely protected from evaporation by the heat of the sun and the strong dry winds. If a field be covered with a system of such devices, each serving to furnish water for a special tree, then one such device, considered as a type of all, instead of watering a tree could be attached to a measuring apparatus, and we should thus know to what extent we were utilizing the fog, apart from the action of the tree itself. In fact, if one wishes, the drip from a given tree may also be measured, in order to know the relative value of the tree and the apparatus as collectors of fog.

It is much more important to stimulate the invention of apparatus to catch the fog and help the tree than it is to establish fog depositors and utilize their records in making up a respectable showing of total precipitation for the arid region. Over the whole world we find both arid regions, and plants that can be cultivated therein. Everyone knows that fog and dew are helpful in such regions. The main question is how to make the best use of them. It is, perhaps, a popular error to imagine that the dewdrops on the leaves are utilized directly by the latter. But we believe it has long since been definitely settled that aqueous vapor evaporates from the leaves and is not absorbed by them. The raindrops, dewdrops, and fog must be carried to the finest roots themselves and be absorbed by them before the water can become a part of the sap and the life of the plant. A foggy atmosphere represents a saturated or nearly saturated condition, such that the atmosphere, flowing by the leaf, does not stimulate evaporation from the leaf, but tends powerfully to the concentration of the moisture within. A too rapid evaporation from the leaf wastes the sap.

The cellular growth of the plant is a relatively slow process, and can not be greatly stimulated without injury to the resulting fruit or other products. But it may be greatly retarded by the scarcity of sap and the increased viscidity of this liquid, produced by an evaporation from the leaf more rapid than the sap can be supplied by the roots. This is shown by the limp and flaccid condition of the tender, green parts of plants under midday sun and dry wind, as compared with the coolness and dew or fog of the moist air during the nighttime. We apprehend that the benefits accruing to delicate plants from the presence of the daily fogs on the California coast result not so much from the drip of the fog caught by the leaves as from the protection offered by the fog against the burning sun's rays. In other countries we have seen similar protection offered by a thin layer of clouds, and in still others the injurious effect of the direct heat of the sun is greatly tempered by the cooling action of a very strong sea breeze.

THE FORMATION OF SNOW IN CLOUDLESS AIR NEAR THE GROUND.

By J. N. WEED, dated Newburgh, N. Y., May 16, 1904.

January 5, 1904, was an extremely cold day. The temperature ranged from 5° to 19° F. below zero.

Within a radius of 15 miles about the city some temperatures as low as —40° were registered. It was notably colder outside of the city than within.

For several hours in the middle of the day there was a gentle and continuous fall of snow flakes, forming about 40 feet above the surface in the middle portion of the street, and slowly falling (with a 10° deviation from the vertical, about,) and gradually increasing in size as they fell. The sky was clear and the air calm.

I went upon the roof to see if the snow was falling there or could be discovered in the air above. It was found to be confined to the street below the tops of the buildings. The windows were decorated with frostwork, showing the presence of vapor in the buildings at least. The street extends north and south parallel with the Hudson River, and is, say, about 25 feet higher and 300 feet distant.

Earlier in the morning there had been a fog haziness upon the water, limiting vision near the surface to half a mile, but this soon cleared away.

Can not an explanation of the snowfall be found in the very low temperature, in the excessive artificial heating of the buildings (which formed an unbroken row on both sides of the street), in the heating effect of the sun's rays on the sides of the buildings and on the flagged side walks (free of snow while the street proper was covered with ice), and last but not least by the escape of the moist, heated, dusty air of the buildings every time an ingress or egress took place? These conditions all tended to induce a rising current on the sides of the street and a falling one in the middle thereof. The rising current, on reaching the cornice of the buildings, was deflected outward and into the falling cold current and its vapor condensed.

One thing is absolutely certain: Snowflakes were formed under a cloudless sky, in the middle of the day, within 50 feet of the ground, in the narrow compass of a street but 50 feet wide.

Snow also fell on the following day under the same conditions, except a moderated temperature; less abundantly, however.

THE ENERGY IN A UNIT OF LIGHT.

By E. BUCKINGHAM, dated May, 1904.

Das mechanische Äquivalent der Lichteinheit; von Knut Ångström; Physikalische Zeitschrift *3*, 257, 1902.

Energie dans le Spectre Visible de l'Étalon Hefner; par Knut Ångström; presented to the Royal Society of Sciences of Upsala, May 6, 1903.

The first of these papers is referred to by its author as a "preliminary note," and since it deals with experiments which form an integral part of the research described in the second paper, its contents will be described in this review of the latter paper, and need not be referred to separately.

The paper before us is divided into five sections, with the following headings: I. Introduction; II. General character of the radiation of the Hefner lamp; III. Distribution of energy in the visible spectrum of the Hefner lamp and the incandescent lamp; IV. Determination of the radiation of the Hefner lamp in absolute measure; V. The radiation in the luminous spectrum of the Hefner lamp, expressed as a function of the wave length.

In spite of the numerous researches that have been made, during the last few years, into the subject of the distribution of energy in the spectra of perfectly black and other radiating bodies, no such research has been made for the visible spectrum of any of our common photometric standards. Such a research has two objects: In the first place, a complete investigation of the visible energy curve of any given photometric standard will enable the future experimenter to investigate the distribution of energy in other visible spectra by spectrophotometric comparison, without having recourse to absolute measurements of energy. In the second place, it will enable us to determine to what degree the relations that have been established for black bodies hold good for the luminous spectra of our ordinary lamps.

The author defines the "visible spectrum" as that part of the complete spectrum for which $\lambda < 0.76\mu$, the energy in the ultraviolet being so small as to make it unnecessary to assign an inferior limit to the wave lengths included in the term "visible." The Hefner lamp used was a normal lamp of the Reichsanstalt form, made by Siemens and Halske; wick tube 0.8 centimeter inside diameter, 0.82 centimeter outside diameter; height above reservoir 3 centimeters; height of flame 4.0 centimeters. The radiation from this lamp, falling normally on an area of 1 square centimeter at a distance of 1 meter, constituted the unit of illumination, or meter-candle, to be investigated.

As a preliminary to the main research, the author compares the infra-red spectra of the Hefner and of an incandescent lamp, which he afterwards uses in some places as a substitute for the Hefner. The incandescent lamp (designed for a current of 0.25 ampere at 16 volts) had a straight filament, surrounded, except for a narrow rectangular opening on one side, by a blackened metal tube. On the side toward the opening in the tube the glass bulb was provided with a fluorite window. The filament was fine enough to permit of forming a fairly pure spectrum without the use of a slit. Infra-red energy curves were obtained by using the author's spectrobolometer.[1] It was found that for $\lambda < 1.50\ \mu$ the Hefner showed no emission bands and that within this region the incandescent lamp, when fed by a current of 0.21 ampere, had an energy curve whose ordinates bore an approximately constant ratio of 0.850 to those of the Hefner curve. A spectrophotometric comparison of the two lamps also showed the entire identity of their distributions of energy in the visible region, for this current strength, so that, later on, it was possible in the spectrum work to substitute for the Hefner the more convenient incandescent lamp.

The method used in investigating the distribution of energy in the visible spectrum may be outlined as follows: By two concave minors and a prism, the spectrum of the incandescent filament was formed. This could be cut off at any desired wave length by a movable screen. The remaining rays were recombined by a cylindrical lens, and allowed to fall on a bolometer, which thus gave the values, in arbitrary units, of

$$I_\lambda = \int_0^\lambda I_\lambda \, d\lambda,$$

where I_λ is the intensity for the wave length λ. By varying the wave length at which the spectrum was cut off by the edge of the screen, the variations of

$$\int_0^\lambda I_\lambda \, d\lambda$$

could be found; in other words, I_λ itself. The micrometer screw that moved the screen was calibrated by replacing the bolometer with a spectrometer, whose scale had already been calibrated in wave lengths, and noting, for various positions of the screw, the wave length at which the spectrum in the spectrometer was cut off by the edge of the screen. The correction for stray light was found by an ingenious process. In place of the bolometer, there was introduced a spectrometer with a double Vierordt slit and a rectangular eyepiece diaphragm. One-half of the slit received the rays which had passed the screen, and the other half those from a Hefner lamp, used as a comparison standard. By comparing the two lights for different positions of the screen and for different wave lengths, the ratio of the stray light to the total could be found and a correction applied to the bolometer readings. This correction nowhere amounted to more than 1.4 per cent. Tables are given showing the values of

$$\int_0^\lambda I_\lambda \, d\lambda,$$

for various values of λ, in terms of the bolometer readings, as well as tables of the same values reduced to absolute measure by means of the following experiments, which form the subject of the preliminary note referred to above.

This part of the work falls under two heads: *(a)* The total radiation, Q, of the Hefner lamp was determined by the Ångström's compensation pyrheliometer,[2] and it was found that at a distance of 1 meter

$$Q = 2.15 \times 10^{-5} [\text{gr. cal. sec.}^{-1} \text{ cm.}^{-2}].$$

(b) To determine $(L_{0.76} \div Q)$, the ratio of the luminous to the total energy, the mirror spectroscope and screen already described were used, the screen being set so as to cut off all rays for which $\lambda > 0.76\mu$. The bolometer was replaced by a photometer head, the other side of which was illuminated by a Hefner lamp so adjusted as to give equal illumination with the incandescent lamp. Thus, one side of the photometer received the total radiation from the Hefner, while the other side received a radiation which was optically the same, but contained none of the infra-red. By now substituting the bolometer for the photometer head, these two radiations were measured and their ratio found. The mean of 4 determinations gave

$$\frac{L_{0.76}}{Q} = 0.0096,$$

and on account of the difficulties of the work, the author fears that this result may possibly be as much as 4 per cent in error. The values of Q and of $L_{0.76}/Q$ being now known, the value of L for $\lambda = 0.76$ may be computed and we have

$$L_{0.76} = 20.6 \times 10^{-8} [\text{gr. cal. sec.}^{-1} \text{ cm.}^{-2}].$$

The use of this value makes possible the reduction of the values of L_λ to absolute units, as stated above.

The last section of the paper is devoted to a comparison of the results with some of the black-body formulæ. Since Wien's equation,

$$I_\lambda = C_1 \lambda^{-5} e^{-c_2/\lambda T},$$

[1] In this instrument the photographic plate, placed horizontally, is rigidly attached to the bolometer arm so that the synchronism is necessarily perfect. The spot of light from the galvanometer mirror is reflected so as to perform its motions in a vertical plane at right angles to the motion of the photographic plate. See Phys. Rev., 3, 137, 1895.

[2] In this instrument, two similar thermojunctions are attached to the backs of two similar, thin, blackened manganine strips. The radiation to be measured falls on one of these strips and heats it. The other strip is then heated to the same temperature—as shown by the thermojunctions—by passing through it a known current. By knowing the values of the current and the resistance, we find the energy needed to bring the second strip to the same temperature as the first; i. e., the radiant energy falling on the first strip.

is, for small values of λT, virtually identical with Planck's more complete equation,

$$I_\lambda = C_1 \lambda^{-5} [e^{c_2/\lambda T} - 1]^{-1},$$

the author has taken Wien's equation and, by the method of least squares, determined the constants in such a way as to give the best representation of his results for the Hefner lamp. The differences between observed and computed values do not appear to exceed the experimental errors. In these computations the temperature T is assumed to be constant, and the equation

$$I_\lambda = 0.0160\, \lambda^{-5} e^{-7.85/\lambda}$$

is found to represent the distribution of energy in the visible spectrum of the Hefner lamp.

Using Paschen and Wanner's value, $c_2 = 14440$, for a black body, and the value 7.85 obtained here, the "black temperature" of the Hefner flame is computed to be 1830° absolute. This value agrees sufficiently well with the temperature of a candle flame which, from Lummer and Pringsheim's experiments, is found, by using the generally accepted equation

$$\lambda_{max.} T = \text{constant} = k,$$

to lie between 1960° and 1750°, on the assumption that for candle flame, k lies between the values it has for a black body and for bright platinum, respectively.

At the end of the paper are two plates showing the instrumental arrangements and giving a graphical representation of the results.

This piece of research is not only valuable in its result, as giving us some definite idea of the energy curve of a common photometric standard, which will enable us to investigate other luminous spectra by photometric methods. It is also a good example of a rather complicated piece of work ingeniously carried through, and it is both interesting and instructive. It is interesting to know that, in form at least, Wien's black-body equation is applicable to the Hefner lamp for $\lambda < 0.76\,\mu$. Angström's computation gives 1830° as the temperature a black body must have to give a spectral energy distribution identical in the visible region with that of the Hefner lamp, and the radiating carbon particles in the flame are probably, for $\lambda < 0.76\,\mu$, pretty nearly black. It would be interesting to have some direct measurement of the temperature of the flame as a whole, and to see how much higher it is than the "black temperature." We may fairly assume that it is higher, because the solid carbon particles, radiating faster than the gaseous portions of the flame, would naturally be cooler; and in the main, at any rate, it is these particles for which we are getting a temperature when we work by radiation methods.

It is advisedly that we say *a* temperature and not *the* temperature. Any calculation of the temperature of a body which is based on radiation involves some assumptions, unless the same temperature has also, at some time or other, been measured by some better established scale; at least, if our calculated temperature is expected to have any meaning in terms of the more familiar scale.

METEOR OF SEPTEMBER 15, 1902.

By E. L. MOSELEY, dated Sandusky, Ohio, May 4, 1904.

September 15, 1902, a remarkable meteor passed northward over Ohio, Ontario, and Michigan. As it passed before daybreak few persons were up early enough to see it. According to a boy who was up early to carry papers, the meteor of September 15 fell into Sandusky Bay about a quarter of a mile from him and he "heard the splash." A man, 5 miles east of the city, said it was "about 75 feet above the ground" when it passed near him. An observer in Cleveland thought it fell into Lake Erie about 5 miles north of the city. Near Meadville, Pa., some workmen "saw it fall in the woods," and a Pittsburg paper undertook to give its weight. By extensive correspondence and the insertion of letters of inquiry in many papers I have learned that it was seen throughout northern Ohio, from Defiance to Ashtabula; in southern Ohio, in Pike, Perry, Morgan, and Washington counties; in western Pennsylvania, at Erie, Edinboro, and Meadville; in New York, at Westfield; in Indiana, at South Bend; in Ontario, at many places between Lake Erie and Lake Huron, also at Drayton and Arthur, east of Lake Huron; in Michigan, at Detroit, Port Huron, Ann Arbor, Lansing, and a number of other places in that part of the State; also in Osceola County about 240 miles west of Arthur, Ontario. So far my efforts to learn of observers in West Virginia or in Michigan north of Saginaw Bay have been unavailing. This, however, does not indicate that the meteor fell into Saginaw Bay, as observers south of that bay thought, or into the southern part of Lake Huron, as observers south of that lake thought. The weather map issued that morning shows cloudy sky at stations in the northern half of Michigan, also in a part of West Virginia, but over most of this portion of North America the sky was clear.

APPEARANCE AND SOUNDS.

The meteor passed over eastern Ohio and southwestern Ontario at about 5:42 a. m., eastern standard time. According to most observers it continued visible between ten and thirty seconds. It was egg-shaped or pear-shaped, with the large end in front. To many it appeared to have about half the diameter of the full moon, but was much brighter, giving probably several times as much light as the full moon. The color was like that of an arc light, white or with a slightly bluish or possibly purplish tinge.

At Waverly, in southern Ohio, a rumbling sound was heard, but correspondents in southeastern Ohio do not report any sound. At many places in northern Ohio sounds were heard, but not very loud. At Defiance, from which the meteor, when nearest, was 160 miles distant, four observers interviewed by Dr. C. E. Slocum heard "a hissing noise." An observer near Sandusky heard "a slight hissing noise about as loud as a bee." M. F. Roberts, directly under the meteor at Mentor, heard "a rushing sound," which also attracted his wife's attention.

In Michigan, E. J. Smith and W. Kearns, at Detroit, heard "a loud sizzling noise." Near Port Huron an observer reported by C. K. Dodge heard "a great crackling and hissing, supposing at first it was his stove."

In Ontario, Andrew Smale, of Union, compared the noise to "that of an electric car running." The noise was heard by a number of persons in and near London, Ontario. J. B. McMurphy says of the sounds, "first like the swish of a falling tree, then changing to a noise similar to the striking of a parlor match on some hard surface with not quite sufficient force to ignite it, but enough to make it snap. It was something like this—bir-rup-bir-rup-bir-rup, then changing to a sound like distant cannon. There were three such sounds as those. All those sounds were as if they had been produced from an echo and reproduced several times, each time growing fainter."

The greater intensity of the sound in Canada than in Ohio I suppose was due to the fact that the meteor was then moving through air not so rare as where it first became visible. The sound seems to have been no more noticeable directly under the meteor than many miles either side of its path.

DURATION AND EXTENT OF THE TRAIN.

The train left by the meteor was observed by many who were not up early enough to see the meteor itself. Geo. D. Berry, near Marietta, Ohio, estimated that it remained visible between five and eight minutes, but all observers farther north who kept watch of it give a longer time, quite a number giving fifteen minutes or twenty minutes or until daylight. C. K. Dodge, of Port Huron, who is doubtless correct, reports it visible there for more than half an hour. The Pontiac reporter

of the Detroit Tribune says "for at least half an hour." J. B. McMurphy, of London, Ontario, assures me that there the train was still visible sometime after sunrise and about an hour and a half after the meteor passed.

As seen from Ypsilanti, Mich., the train extended so far from south to north that Mrs. F. K. Owen, looking out of an east window, was unable to see either end of it. As seen at Port Huron it extended quite to the horizon at a point a little west of north.

At first the train formed an even curve or, as seen from some places, nearly a straight line, but in a few minutes it began to be sinuous and gradually became quite zig-zag, as described by a number of observers.

J. B. McMurphy writes from London, Ontario: "The sparks were very numerous and about the color of ordinary fire sparks. Later they appeared gray like ashes." Others speak of the train as "white," "a light streak," "lead-colored streak," "phosphorescent glow," "color of full moon on a clear night;" Mrs. Owen, at Ypsilanti, "a band of shining light, silvery white, brighter toward the north, faded toward the south;" D. C. Johnson, at Marblehead, Ohio: "Sparks appeared to turn to white ashes that stayed until the wind blew them away."

PATH.

At Somerset, Perry County, Ohio, several observers interviewed by Chas. W. Cookson, saw the meteor pass to the east, about halfway between zenith and horizon. At Alliance, Stark County, Ohio, Prof. B. F. Yanney reports, but not from personal observation, that the meteor was first seen near the zenith. Observers at Cleveland and farther west saw it pass them on the east, though in eastern Cleveland it appeared not many degrees from the zenith. After many attempts to find an observer not far east of Cleveland, I heard through Mary E. Mathews, of Lake Erie College, of an observation made by Marcus F. Roberts and wife. He wrote that the meteor "passed directly over Mentor village at a point between Heart and Center streets." After sending him my first article on the meteor, published in Popular Astronomy, I wrote inquiring whether the meteor seemed to pass *exactly* over him or whether it seemed to pass over a point near him. He replied: "The meteor did not seem to be exactly overhead, but a little to the west."

In Ontario, George M. Tupholme, of Ridgetown, replied to a similiar question: "The meteor passed a very slight point to the west of me, nearly overhead." According to J. B. George, quoted by J. B. McMurphy, "it passed almost directly overhead," he being that morning at Croton. At Sarnia, Mrs. D. McLaren says: "I think that the meteor was a little east of Sarnia, judging by the trail, but my first impression was that it had passed exactly overhead; it looked so as it sped on its way northward. A neighbor of ours also saw it. He thinks, too, that it was a little east of Sarnia." C. K. Dodge, a customs officer at Port Huron, Mich., writes: "My office is situated west of the city of Port Huron, perhaps a mile and a quarter from a north and south line passing through the center of the city. This streak seemed to be to the east of my office and to pass directly over the city of Port Huron, or rather nearer to me than that. The deflection to the east from a perpendicular line where I stood would not be more than 15°. It seemed nearly overhead." If the zenith distance at Mr. Dodge's office was not more than 15° the meteor could not have passed much more than 4 miles east of Sarnia.

According to the maps at my disposal, the arc of a great circle passing 4 miles east of Sarnia and 6 miles west of Mentor passes 5 miles east of Alliance, 3½ miles west of Ridgetown and about 1 mile west of Croton.

ELEVATION.

Lewis Schwartz had just gone through his gate at Sandusky, when turning about he saw the meteor pass between the cross-arms of a telegraph pole. Standing in the same place some days afterwards he directed a ruler toward the opening between these cross arms while I held a card beside the ruler, with its lower edge horizontal, and traced upon it a line along the edge of the ruler. This gave an angle of 49½°. In like manner Harriet Clemons obtained the altitude of 44⅓° from D. C. Johnson at Lakeside, 7 miles north of Sandusky and about the same distance as Sandusky from the path of the meteor. Willard House, 5 miles south of Sandusky, also about the same distance from the path of the meteor, estimated the altitude at 45°, but this was merely an estimate. The first of these determinations is likely to involve the least error, because Mr. Schwartz although young and without knowledge of astronomy, had the means of recalling his position probably within a foot or two, and also the place where the meteor crossed the telegraph pole. If we adopt 47° as the highest apparent altitude reached by the meteor as seen from Sandusky we will probably not have it too high nor much too low. This corresponds to an elevation of 73 miles when the meteor was east of Cleveland. That this result is not far from correct is shown by an analysis of reports obtained from Defiance through the efforts of Dr. C. E. Slocum. Three witnesses interviewed by him agreed "that it was about one-third, possibly more, of the distance between the horizon and zenith." A fourth witness at the time of observation was driving east and had gone about 7 miles from Defiance. He estimated that the meteor was about one-fourth the distance to the zenith. Inasmuch as persons are likely to overestimate distances near the horizon, and inasmuch as the fourth witness was an intelligent man and had ample opportunity to observe the meteor and its train, his estimate is likely to be more nearly correct than that of the first three. Later, Dr. Slocum found that J. F. Heilshorn, a voluntary weather observer, living 4½ miles east of Defiance, had measured the altitude and found it 23°. From correspondence with J. F. Heilshorn, after he had removed from Ohio, I learned that he did not see the meteor itself but saw the train, and later got the angle by means of a branch of a tree. His brother, Harry Heilshorn, saw the meteor pass. He is still on the place, and at my request he sent me a drawing of the angle. This measured 23°. From further correspondence I infer that he does not consider this reliable to nearer than one or two degrees. The plane of this angle passes through Sandusky or very near it. An elevation of 73 miles corresponds to an altitude a trifle less than 24° at Mr. Heilshorn's place.

In Ontario, J. B. McMurphy, 7 miles west of London, measured the least zenith distance with a quadrant and found it 35°. This was several days after the meteor had passed, but is probably correct within two or three degrees. A zenith distance of 35° at a distance of 40 miles from the track of the meteor corresponds to an elevation of about 38½ miles. A line from London to Detroit intersects the meteor's track nearly at right angles.

At Detroit, E. J. Smith and W. Kearns were together when they saw the meteor, also when I interviewed them a year later. When asked if the meteor was half way up from horizon to zenith, they had no hesitation in saying "more than half way." Now, an elevation of 58½ miles corresponds to an angle of about 46° at Detroit; so it is not probable that the elevation between Detroit and London was less than 58½ miles.

To Lewis Schwartz, at Sandusky, the meteor seemed to strike the water of Sandusky Bay close to the corner of a certain dock. From this I found that the place of disappearance was 14° west of the meridian. A line drawn in this direction intersects the track of the meteor in Algona County, Mich., 200 miles north of the Ohio boundary.

Reports from Defiance regarding the point of disappearance, though not definite, lead me to think that there, also, the meteor remained visible until it had gone about 200 miles north

of the Ohio boundary. It must have passed a little west of Alpena and between Mackinaw and Sault Ste. Marie if it continued so far without change of course. It probably passed nearly over Steubenville, Ohio, and between Wheeling, W. Va., and Washington, Pa.; but as yet I have not learned of its having been seen at any of these places or at any place near them.

If those persons who are fortunate enough to witness the passage of such a great meteor would note carefully the point of disappearance in reference to chimneys, houses, trees, poles, etc., and their own position at the time of observation, it would facilitate the determination of the path. If the meteor leaves a bright train of sparks behind it, then the observer, by walking a few steps, should at once get the highest part of the train in line with the top of a chimney or some other permanent object that can be identified at any future time, and then note accurately his own position, so that ultimately the exact azimuth and altitude can be determined. If the meteor is seen to burst, its altitude and azimuth at that moment should be determined as accurately as possible.

If we have a large number of well observed altitudes, azimuths, and the times of first and last appearance, or the time and position of the maximum apparent altitude of the meteor, then the astronomer can determine quite accurately the absolute altitude, the speed in miles per second, and the orbit of the meteor relative to the earth and the sun. A number of meteors have been thus investigated. Many of the largest have been shown to pass through our atmosphere and continue on in their courses through planetary space.

Such a large number of minute meteors, ordinarily known as shooting stars, are burned up in the atmosphere daily as to constitute a slight, barely appreciable source of heat and dust. The result is not considered as of any importance to current meteorology, but the accumulation of meteoric dust through long geologic ages may have an important relation to both the earth and the atmosphere.—ED.

RECENT PAPERS BEARING ON METEOROLOGY.

Dr. W. F. R. PHILLIPS, Librarian, etc.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——.

Scientific American. New York. Vol. 90.

Serviss, Garrett P. Soaring Flight. P. 343.

Scientific American Supplement. New York. Vol. 57.

Harmon, H. W. Electrically-registering Wind Vane and Anemometer for school use. P. 23713.

Symons's Meteorological Magazine. London. Vol. 39.

Ellis, William. Some weather prophets. Pp. 43–47.

Geographical Journal. London. Vol. 23.

Cornish, Vaughan. On the Dimensions of Deep-Sea Waves, and their relation to Meteorological and Geographical Conditions. Pp. 623–645.

Terrestrial Magnetism and Atmospheric Electricity. Baltimore. Vol. 9.

Bauer, L. A. Magnetic Storm of October 31–November 1, 1903, recorded at the Coast and Geodetic Survey Magnetic Observatories. Pp. 25–27.

Bulletin of the American Geographical Society. New York. Vol. 36.

Ward, Robert DeC. "Sensible Temperatures." Pp. 129–138.

Review of Reviews. London. Vol. 29.

Waldo, Frank. Climatic Features of the Field of the Russo-Japanese War. Pp. 582–584.

Proceedings of the American Philosophical Society. Philadelphia. Vol. 43.

Haupt, Lewis M. The Mississippi River Problem. Pp. 71–96.

Quarterly Journal of the Royal Meteorological Society. London. Vol. 30.

Wilson-Barker, D. The Present Position of Ocean Meteorology. Pp. 105–123.

Mawley, Edward. Report on the Phenological Observations for 1903. Pp. 123–153.

Dines, W. H. Observations by Means of Kites at Crinan in the summer of 1903. Pp. 155–166.

Strachan, Richard. Climatic Influence on Vineyards. Pp. 173–175.

Thomas, T. J. Rainfall at Ebbw Vale Waterworks. Pp. 175–177.

Lugard, F. D. Climate of Northern Nigeria. Pp. 179–180.

Ciel et Terre. Bruxelles. 25me année.

—— Observations météorologiques de la mission saharienne Foureau-Lamy. Pp. 115–118.

Journal de Physique. Paris. 4me séries. Tome 3.

Nordmann, Ch. Le rayonnement hertzien du soleil et les aurores boréales. Pp. 281–316.

La Nature. Paris. 32me année.

R. C. Le temps en Islande et le temps en Europe occidentale. P. 322.

Plumandon, J. R. Les crépuscules rouges. Pp. 325–328.

M., P. de. La foudre et les clôtures métalliques. P. 336.

La Géographie. Paris. Vol. 9.

Angot, A. Les observations météorologiques de la mission saharienne Foureau-Lamy. Pp. 1–4.

Annalen der Hydroraphie und Maritimen Meteorologie. Berlin. 32 Jahrgang.

Bebber, W. J. van. Bemerkenswerte Stürme. Weitere Folge. I. Sturm vom 6. bis 8. April 1904. Pp. 195–198.

—— Ergebnisse der meteorologischen Beobachtungen in Tsingtau September 1898 bis August 1903. Pp. 198–204.

Wegemann, G. Einfluss des Windes und Luftdrucks auf die Gezeiten. Pp. 204–208.

Das Weltall. Berlin. 4 Jahrgang.

Archenhold, F. S. Die Temperatur der Luft über Berlin. Pp. 272–273.

Wiener Luftschiffer-Zeitung. Wien. 3 Jahrgang.

Silberer, Victor. Grundzüge der praktischen Luftschiffahrt. Pp. 77–80.

Annalen der Physik. Leipzig. Vierte Folge. Band 13.

Mie, Gustav. Der elektrische Strom in ionisierter Luft in einem ebenen Kondensator. Pp. 857–889.

Meteorologische Zeitschrift. Wien. Band 21.

Prohaska, K. Das Hochwasser vom 13 zum 14 September in den Ostalpen. Pp. 153–162.

Exner, F. M. Einige Untersuchungen über Sonnenstrahlung. Pp. 162–169.

Draenert, F. M. Das Klima von Blumenau im Staate Santa Catharina, Brasilien. Pp. 169–175.

Süring, R. Barometervergleichungen der meteorologischen Institute in Berlin und Wien. Pp. 177–178.

Hann, J. Täglicher Gang des Barometers zu Ponta Delgada, S. Miguel, Azoren. Pp. 178–179.

Polis, P. Ergebnisse der täglichen Periode der Lufttemperatur und die Erdbodentemperatur von Aachen 1896–1900. Pp. 179–181.

Hegyfoky, J. Häufigkeit der W.-und E.-Luftströmung in Ungarn. Pp. 182–185.

—— Resultate der meteorologischen Beobachtungen auf dem Mont Ventoux in den Jahren 1901 und 1902. Pp. 185–186.

—— Regenfall in Cherra Poonjee. Pp. 186–187.

—— Klima von Merzifun, Kleinasien. P. 187.

Bergholz, — Regenfall in Ceylon. Pp. 187–188.

—— Resultate der meteorologischen Beobachtungen zu Zi-ka-wei 1873 bis 1900. Pp. 188–189.

—— Täglicher Gang der Temperatur zu Zi-ka-wei. P. 189.

—— Regenfall zu Funchal auf Madeira 1896–1901. P. 190.

—— Regenmessungen auf der Pflanzung Ngambo (Deutsch-Ostafrica) in den Jahren 1898–1901. Pp. 190–191.

—— Resultate der meteorologischen Beobachtungen zu Majunga (Madagaskar) im Jahre 1900. Pp. 191–192.

—— Resultate der Regenmessungen auf den Karolinen und Palau-Inseln. Pp. 192–193.

—— Meteorologischen Beobachtungen, angestellt in Yap (Karolinen) vom 1 Dezember 1899–22 Juni 1900, von Prof. Dr. G. Volkens. Pp. 193–194.

—— Regenfall in Nieder-Kalifornien. Pp. 194–196.

—— Regenfall zu Sucre (Bolivien). P. 196.

Hann, J. N.-Föhn zu St. Andrä im Lavanttale. P. 196.

Knipping, E. Formel zur Umwandlung der Beaufort-Grade in Metermass. Pp. 196–197.

Dorn, — Eine Beobachtung des "grünen Strahls." P. 197.
Hann, J. Sonnenschein in Wien im Winter 1903–1904. Pp. 197–198.
Wolfer, A. Provisorische Sonenflecken-Relativzahlen. P. 198.
Das Wetter. Berlin. 21 Jahrgang.
Walter, Gustav. Der Wert der Beobachtungen auf dem Ben Nevis in Schottland für die Wetterprognosen. Pp. 81–84.
—— Eine elektro-magnetische Theorie des Nordlichtes. Pp. 92–93.
Gaea. Leipzig. 40 Jahrgang.
—— Luftelektrizität und Erdladung. [Abstract of work of H. Ebert.] Pp. 330–335.
—— Die klimatischen Verhaltnisse der Mandschurei. Pp. 374–375.

BAROMETRIC PRESSURE AT ORONO, ME.

By Prof. JAMES S. STEVENS, dated Orono, Me., April 12, 1904.

Referring to my previous paper in the MONTHLY WEATHER REVIEW, November, 1903, p. 528, I may say that the meteorological station at Orono, Me., is connected with the Maine State College, now the University of Maine. Its records begin with January 1, 1869. Up to the year 1892, inclusive, they were kept by Dr. M. C. Fernald, then president of the college. Since that time they have been in charge of the Maine Agricultural Experiment Station. In 1893, and subsequently, some of the observations were omitted, and the methods of recording were not entirely uniform. I have undertaken to summarize the results for publication, and the subjects treated will appear from time to time in the following order: Barometry, thermometry, moisture, prevailing winds, wind velocity, cloudiness, general atmospheric conditions, optical and electrical phenomena conclusions.

1. *Barometry.*—The instrument used in the earlier period of these observations was made by J. S. F. Huddleston of Boston, Mass. It was twice compared with a standard instrument, and the error was regarded as small enough to be negligible, but was considered when making the observation. In later years the barometer used was one manufactured by James Green of New York City. It had an error of 0.003, and this error was always considered in recording. Recent standardization shows this barometer to have a negligible error. The times of observation were 7 a. m., 2 p. m., and 9 p. m. The altitude above sea level, as determined by means of the spirit level, was 134 feet from January, 1869, to June 11, 1879, and 129 feet from that time to January, 1893; during the remainder of the period to the present time it is 148 feet. The dates of the missing records were as follows: 1869, June and December; 1893, two-thirds of January; 1895, January and December; 1896, January, February, and June. From October, 1899 to 1903, inclusive, observations were made at 2 p. m. only.

The means published herewith have been reduced to the standard instrumental temperature. The latitude is 44° 54′ north and altitude small; therefore the gravity corrections may be neglected as being probably zero. The observations have been reduced to sea level by the formulæ and tables given in the Weather Bureau Instructions to Voluntary Observers. In order to take annual and other means I have thought it best to give in italics the best values I could obtain by interpolation between the months contiguous to those for which the data were fragmentary or missing. The means depend in part, therefore, upon graphic interpolations, using the monthly charts of the MONTHLY WEATHER REVIEW for that purpose. The year 1896 was rejected in taking the average.

The figures are the hundredths of an inch and range from 29.54 to 30.12. The figures in italics in Table 1 imply that a number of observations were missing.

TABLE 2.—*Monthly and annual barometric pressure at 2 p. m. at Orono, Me.*

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1900..	75	77	71	72	74	72	72	92	85	98	82	81
1901..	75	50	71	.....	.....	.....	.....	.....	85	87	72	83
1902..	82	58	76	71	77	65	79	74	92	82	84	84
1903..	68	73	04	70	95	85	67	86	90	85	78	74

TABLE 1.—*Monthly and annual barometric pressure at Orono, Me., reduced to sea level and standard gravity.*

	January.			February.			March.			April.			May.			June.			July.			August.			September.			October.			November.			December.			
	7 a.	2 p.	9 p.	Mn.	7 a.	2 p.	9 p.	Mn.	7 a.	2 p.	9 p.	Mn.	7 a.	2 p.	9 p.	Mn.	7 a.	2 p.	9 p.	Mn.	7 a.	2 p.	9 p.	Mn.	7 a.	2 p.	9 p.	Mn.	7 a.	2 p.	9 p.	Mn.	7 a.	2 p.	9 p.	Mn.
1869.....	79	74	77	77	73	69	70	71	85	81	82	83	65	61	63	63	70	66	70	69	84	72	74	74	82	76	81	82	76	74	72	73	63	61	63	63
1870.....	93	90	91	94	80	69	79	78	76	74	77	76	81	77	79	79	84	80	84	81	78	74	77	76	79	76	79	78	73	68	69	70	79	76	79	78
1871.....	00	01	98	99	72	76	75	77	82	77	79	79	77	76	76	77	74	69	71	71	77	76	77	77	78	76	77	77	76	70	67	70	72	71	72	72
1872.....	73	69	72	71	74	69	71	71	72	68	72	73	72	74	74	74	77	75	76	76	75	73	74	73	75	73	74	73	73	72	73	73	75	73	74	73
1873.....	88	86	90	89	72	68	68	69	68	67	68	68	69	69	70	69	82	78	79	79	80	78	79	79	80	78	79	79	78	76	77	77	78	76	78	78
1874.....	02	98	97	99	93	91	93	93	65	63	63	65	76	73	75	75	84	79	80	80	88	84	85	85	88	84	85	85	84	82	83	84	86	84	86	86
1875.....	98	92	90	94	80	78	77	78	92	87	91	91	77	75	79	75	84	78	79	79	86	82	84	84	86	82	84	84	82	80	81	81	86	84	86	86
1876.....	87	83	88	85	86	81	85	83	82	77	79	79	78	74	79	79	82	76	79	78	82	78	80	80	82	78	80	80	78	76	78	78	96	95	96	96
1877.....	88	85	88	87	80	76	78	78	84	82	83	82	75	74	77	76	80	76	78	78	80	77	79	78	80	77	79	78	77	75	76	76	89	87	89	89
1878.....	84	83	87	85	80	77	78	79	77	74	76	75	76	74	77	76	82	78	79	78	80	77	79	78	80	77	79	79	77	75	76	76	87	85	87	87
1879.....	75	71	72	73	80	78	80	80	89	86	89	89	74	72	75	74	82	78	80	80	84	80	82	82	84	80	82	82	80	78	79	79	81	79	81	81
1880.....	03	93	03	00	90	85	88	89	91	86	89	88	83	78	81	81	85	79	81	81	86	82	84	84	86	82	84	84	82	80	81	81	90	88	90	90
1881.....	95	91	92	93	92	93	98	98	59	57	59	58	65	59	64	65	78	73	77	76	79	75	78	78	80	76	79	79	78	76	77	77	94	92	94	94
1882.....	91	87	90	91	94	91	98	98	92	87	90	90	82	77	79	78	86	82	84	84	88	84	86	86	88	84	86	86	84	82	83	83	89	87	89	89
1883.....	06	01	02	03	05	00	03	03	77	73	77	75	74	73	74	74	79	75	78	77	79	76	78	78	79	77	79	79	77	75	76	76	81	79	81	81
1884.....	98	94	93	95	00	92	94	96	89	85	89	89	77	73	77	75	85	79	81	81	87	83	85	85	87	83	85	85	83	81	82	82	87	85	87	87
1885.....	91	87	90	89	86	80	83	84	86	83	86	85	78	76	78	78	86	83	85	85	88	86	88	88	90	87	90	90	88	86	87	87	93	91	93	93
1886.....	93	92	95	93	86	83	86	85	77	74	77	77	73	71	74	74	83	79	81	81	85	82	84	84	86	83	85	85	83	81	82	82	94	92	94	94
1887.....	88	90	87	88	86	81	85	85	76	74	76	76	74	72	74	74	84	80	82	82	86	83	85	85	87	84	86	86	84	82	83	83	91	89	91	91
1888.....	93	87	89	90	84	78	82	82	76	74	76	76	74	72	74	74	82	78	80	80	84	80	82	82	84	80	82	82	80	78	79	79	89	87	89	89
1889.....	87	84	85	85	82	78	81	81	85	82	85	85	77	75	77	76	85	80	82	82	86	82	84	84	86	82	84	84	82	80	81	81	94	92	94	94
1890.....	05	98	00	00	95	92	96	95	92	90	92	92	84	82	84	84	92	88	90	90	94	90	92	92	94	90	92	92	90	88	89	89	96	94	96	96
1891.....	90	89	89	89	92	89	92	92	90	88	90	90	82	80	82	82	90	86	88	88	90	86	88	88	90	86	88	88	86	84	85	85	94	92	94	94
1892.....	90	85	88	88	88	85	88	88	86	83	86	86	76	74	76	76	84	80	82	82	86	82	84	84	86	82	84	84	82	80	81	81	89	87	89	89
1893.....	95	89	92	92	93	93	93	93	91	89	91	91	85	83	85	85	93	89	91	91	93	89	91	91	93	89	91	91	89	87	88	88	96	94	96	96
1894.....	00	98	98	98	93	92	97	96	78	76	78	78	76	74	76	76	85	81	83	83	87	84	86	86	88	85	87	87	85	83	84	84	96	94	96	96
1895.....	90	86	87	87	73	63	72	72	84	81	84	84	72	70	72	72	82	78	80	80	84	80	82	82	84	80	82	82	80	78	79	79	89	87	89	89
1896.....																																				
1897.....	80	82	89	86	95	87	90	91	89	86	89	89	78	76	78	78	86	82	84	84	88	84	86	86	88	84	86	86	84	82	83	83	91	89	91	91
1898.....	79	75	80	80	91	87	91	91	90	87	90	90	82	80	82	82	90	86	88	88	92	88	90	90	92	88	90	90	88	86	87	87	94	92	94	94
1899.....	87	86	87	87	75	75	77	76	77	73	76	76	74	73	74	74	84	80	82	82	86	82	84	84	86	82	84	84	82	80	81	81	92	90	92	92
Mean	01	97	99	99	86	82	86	86	81	78	81	81	76	74	76	76	85	81	83	83	87	83	85	85	87	83	85	85	83	81	82	82	92	90	92	92

ORIGIN OF AMERICAN COLD WAVES.

By R. F. STUPART, Director Meteorological Service, Canada, dated Toronto, May 17, 1904.

As yet I am unable to add much to what I said in my letter of February 9. Without doubt, however, the question is so intimately connected with the movement of high and low areas, that I am having some maps printed, taking in all the northern territories almost to the Arctic Sea, as it appears to me this is the best way of arriving at results. With the barometer reading at Dawson, York Factory, Fort Chipewyan, Moose Factory, and Norway House, we shall be able to extend our isobars and get a better idea of the formation and subsequent movement of highs and the accompanying cold waves. From the further work I have done I think it is apparent that in some seasons pronounced cold waves developing in Yukon, or in the far North, never reach either Alberta or Manitoba. In other months, while there is nothing abnormal in the far Northwest, a cold wave may develop just north of Manitoba and Ontario, and the temperature in these provinces fall almost as low as near the Arctic Circle. I am satisfied, however, that it is true in a general way that a cold wave may be expected in Manitoba about five days after it sets in over the Klondike.

INCREASED FLOW OF SPRING WATER IN THE AUTUMN[1].

By G. A. LOVELAND, Section Director, dated Lincoln, Neb., May 28, 1904.

Many of the inhabitants of north-central and northwestern Nebraska have become convinced by casual observation that there is an increased flow of water from natural springs during the fall and winter months, and that at the same time water in the marshes and small lakes of the region increases in depth. So far as the writer is aware, no measurements have been made by which the times and amounts of fluctuation can be determined with any exactness. While lack of such measurements limits the discussion, some facts affecting water supply in this region can be presented. These facts relate to: 1. Geological structure. 2. Precipitation and temperature. 3. Evaporation. 4. Run-off in streams.

1. *Geological structure.*—The surface soil in Nebraska west of the ninety-eighth meridian and north of the Platte River is sandy in formation. In fact, about 24,000 square miles in the central portion of the region (65 per cent of the entire district) are occupied by wind-blown sands, constituting the great sand-hill district. North and west of the sand hills are large areas of Arikaree and Ogalalla formation, both with a large proportion of sand in their composition. Outcropping near the Platte River, and underlying most of the western third of the territory under consideration, is the Brule clay. Beneath all these, and underlying all of Nebraska west of the ninety-eighth meridian, and extending considerably east of that meridian in some localities, is the Pierre clay. Its surface outcrops are in the lower portion of the Niobrara Valley, the Republican Valley, and the extreme northwestern portion of the State. It is a mass of nearly impervious Cretaceous clay and shale 1000 to 2000 feet thick in the central and western portions of Nebraska.

At some distance beneath this Pierre clay is the water-bearing Dakota sandstone formation, which outcrops in the eastern portion of Nebraska and carries the great artesian water supplies which are so extensively developed in South Dakota and northeastern Nebraska. This formation also furnishes water for springs and wells in southeastern Nebraska; but it does not affect the surface water supply in the northwestern portion of the State, for the Dakota sandstone is separated from the sandy surface soil by the thick and nearly impervious layer of Pierre clay.

[1] The present paper relates to the subject of the flow of spring water after the first killing frost mentioned in the Monthly Weather Review for January, 1904, p. 23.

The water supply for the springs and lakes of this district is a question of precipitation upon, evaporation from, and percolation through a sandy soil, varying from 100 to 400 feet in thickness.

2. *Precipitation and temperature.*—Nearly one-half the annual precipitation occurs during the three months of May, June, and July, while only about one-eighth of the annual amount falls during the four months of November, December, January, and February. The following table contains the monthly and annual average precipitation, in inches, for the district, computed from the records of the past twenty-eight years:

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
0.52	0.65	1.05	2.18	3.12	3.37	3.06	2.23	1.53	1.17	0.48	0.60	19.96

The following table contains the monthly and annual average temperatures for the district, computed from the records of the past eighteen years:

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
21.9	22.8	32.8	48.3	58.4	68.1	73.8	71.9	62.5	49.9	34.6	27.2	47.8

The water sinks readily into the sandy, permeable soil until it strikes the nearly impermeable clay layer beneath; then, as it can go no farther downward, it saturates the soil, raising the surface of the saturated zone (which is called the water table) toward the surface until it is high enough for the water to flow off laterally through the soil to a ravine or low spot. Here the water comes to the surface and either evaporates or passes along the ravines to the rivers that drain the district. These rivers carry the water across the eastern or lower outcropping areas of the Pierre clay.

3. *Evaporation.*—The evaporation is very large in summer from the surface of both water and soil. The latter, because of its sandy nature, becomes very hot under the rays of the summer sun. A relatively small proportion of the rainfall is absorbed by the vegetation. No satisfactory measurements of evaporation are available, but it is believed the following table[2] fairly presents the evaporation from a free water surface, in inches, and its variation throughout the year:

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1.92	2.73	3.20	4.83	5.06	5.33	6.68	5.81	4.80	3.36	1.86	2.66	48.24

4. *Run-off in streams.*—That the volume of water in rivers draining this region is remarkably uniform, is shown by the daily gagings. The surface run-off after heavy rains is very much less than from most soils, and the large body of saturated sand furnishes water to prevent a large decrease during dry periods.

The run-off from three rivers of the region has been measured for a period of from two to five years; the Niobrara at Valentine, and the North Loup and Middle Loup at St. Paul. The daily mean flow in cubic feet per second is given in the following table. Unfortunately there were no measurements in the winter months for the longer records:

[2] Computed from the data published in Climate and Crop Report for Nebraska, November, 1896.

Month.	Middle Loup.		North Loup.		Niobrara.	
	Flow in cubic feet per second.	Length of record.	Flow in cubic feet per second.	Length of record.	Flow in cubic feet per second.	Length of record.
		Years.		*Years.*		*Years.*
February					998	1
March					1,260	2
April	1,450	4	1,382	4	937	2
May	1,159	4	1,145	5	798	2
June	1,471	5	1,336	5	716	2
July	1,206	5	999	5	860	2
August	962	4	1,048	5	748	2
September	979	5	887	5	644	2
October	1,072	5	997	5	715	2
November	1,015	2	1,165	2	766	2
December					708	2

Conclusions.—An exceedingly large amount of the water in a heavy rain is absorbed by the sandy soil. This raises the water table, which conforms quite closely to the contour lines of the country for a time. A leveling process begins immediately by the water passing from the higher to the lower places along the slope of the water table. The rapidity of movement depends upon the "head" or steepness of the grade, and the texture of the soil.

The surface of the water in the marshes and lakes of the region indicates the elevation of the water table at that place. The rise and fall of the water in a lake will depend upon the relation which the supply of water, flowing to it down the slope of the water table from the higher elevations in the high lands bears to the loss, by evaporation from the surface of the lake and the flow on down the water table to the rivers. This flow from the lake may be in part on the surface at an outlet, or, as in this region, mainly, in some cases entirely, through the soil by slow percolation.

The movement of the ground water is slow, even in this permeable soil. The great sand-filled basin acts as a natural reservoir, more perfectly than a lake, because of the less evaporation from a surface of sand than of water and the slow flow toward the outlet.

In discussing the amount of ground water Mr. G. W. Rafter[3] divides the year into three periods; the storage period, including December to May; the growing period, June to August, when evaporation and absorption are most noticeable, and ground water tends to become lower; the replenishing period, September to November, when the demands on ground water are less, and it tends to return to normal height.

The record of water movement in the streams of this district seems to indicate that September is the month of least run-off, followed by an increase in October and November. The replenishing period may begin a little later than the time selected by Mr. Rafter, or it may become apparent in the springs and lakes in the interior earlier than it shows in the rivers.

In the article on "The disposition of rainfall in the basin of the Chagres" in the MONTHLY WEATHER REVIEW for February, 1904, p. 64, Table 7 shows that the heaviest rainfall occurs in July, while the greatest outflow due to ground water occurs in November, or four months later. This, with the slow movement of ground water through a sandy soil, as determined by Mr. C. S. Slichter,[4] seems to justify the suggestion that the heavy rainfall of early summer, absorbed on the hills, would percolate through the soil and reach the lower levels from four to six months later.

It would seem that the increased water reported might be explained by the slow percolation of the water from the heavy rainfall of May, June, and July, combined with the decreased evaporation due to lower temperature, and the smaller demands of vegetation; in fact, to the general law of increase in ground water in this the replenishing period. Local conditions of soil and climate emphasize this increase, making it more noticeable than in most places.

[3] Water Supply and Irrigation Papers of the United States Geological Survey, No. 80, p. 17. [4] Water Supply and Irrigation Papers, No. 67, United States Geological Survey, p. 27.

AUTHORITIES.

Geological structure.—Dr. G. E. Condra, associate professor of geology, University of Nebraska, and Professional Papers, No. 17. United States Geological Survey.

Evaporation.—Table from Monthy Report, Nebraska Section of Climate and Crop Service, United States Weather Bureau, for November, 1896.

Run-off.—Tables furnished by Prof. O. V. P. Stout, professor of civil engineering, University of Nebraska.

THE TEMPERATURE OF THE AIR ABOVE BERLIN.

FROM OCTOBER 1, 1902, TO DECEMBER 31, 1903, AS SHOWN BY THE DAILY ASCENTS EXECUTED AT THE AERONAUTICAL OBSERVATORY OF THE ROYAL METEOROLOGICAL INSTITUTE OF PRUSSIA.

By PROF. DR. RICHARD ASSMANN, Director of the Observatory.

There are four methods employed by modern aeronautics for scientific purposes:

1. *Ascents of free balloons*, carrying one or more observers. After the famous voyages of James Glaisher, in the years 1862–1866, free ascensions were seriously taken up again in 1891 at Berlin, and since then executed in large number with improved instruments (especially Assmann's aspirated psychrometer) up to the greatest height ever reached (10,800 meters, Berson and Süring on July 31, 1901).[1]

2. *Ascents of smaller balloons carryiny self-registering instruments*, after the example of Hermite and Besançon at Paris, called "ballons-sondes," a method tested above all by Teisserenc de Bort at Paris by hundreds of ascents. Instead of balloons of 40 to 100 cubic meters of silk or paper, as employed elsewhere, the Aeronautical Observatory at Berlin makes use of small elastic rubber balloons holding but 2 or 3 cubic meters, which, increasing in volume with the height, ascend with increasing velocity and finally burst, without reaching an equilibrium, and a parachute brings the apparatus safely to the ground. An ascent up to 20,000 meters takes but an hour's time or little more, and so does the descent; thus the rubber balloon hardly ever covers a distance of more than 50 to 70 kilometers in its flight.

3. *Lifting of registering instruments by means of kites.*

* * * * * * *

4. In case of the wind being too weak to lift kites (below 5 or 6 meters per second) the *kite-balloon of Sigsfeld-Parseval* (capacity 68 cubic meters of hydrogen) is used and enables us to reach heights up to 2500 meters.

The Aeronautical Observatory of the Royal Meteorological Institute of Prussia, established in the year 1899 near the shooting camp of Tegel in very modest dimensions, avails itself of all the four methods above mentioned. In spite of its unfavorable situation amid extensive forests, and the perils and hindrances resulting from the vicinity of Berlin with its electric street car lines, as well as the neighborhood of the military grounds (shooting camp and barracks of the balloon division) since August, 1902, there have been made daily ascents with kites or kite-balloons without any regard to the weather. The results thereof have been regularly published through the medium of the Berlin Weather Bureau, in the Official Gazette of the same day and in several of the more important evening papers of the metropolis, as well as in the daily weather charts of the Deutsche Seewarte at Hamburg and of the Berlin Weather Bureau.

The regular ascents are made in the mornings; the publica-

[1] The four ascensions made by Hammond in 1885 from Philadelphia also gave excellent results with the sling psychrometer.—ED.

tion of the results in the charts makes it necessary to get through with the experiments by 12 and with the readings by 12:30 p. m. But ascents are made besides at other times, and on the days of the international ascents generally the whole night is being worked through. The readings are given for fixed intervals of height; the published data are air temperature, relative humidity, direction and velocity of wind for the base (40 meters above sea level) and for 200, 500, 1000, 1500 meters, etc.; a few words about anomalies in the vertical distribution of those elements and the limits of the cloud strata are added.

In the publication of the higher ascents some of the above-given intervals are omitted for want of space.

The publication in the Official Gazette runs as follows:

"Readings at the Aeronautical Observatory of the Royal Meteorological Institute published by the Berlin Weather Bureau.

Kite ascent of December 4, 1903, 8:30 to 11 o'clock a. m.

Height above sea level.	40 meters.	500 meters.	1000 meters.	2000 meters.	3000 meters.	3540 meters.
Temperature (C.)	—4.8	— 2.7	— 5.4	— 6.2	—11.8	—14.1
Relative humidity, per cent.	86	76	70	24	1	1
Direction of wind	se.	s.	s.	ssw.	ssw.	ssw.
Velocity of wind, meters per second	4.2	10.0	11.0	14.0	17.2	16.0

Cloudless. — The temperature increased from the ground up to 500 meters, and again from — 6.1 to — 5.2 C. between 1075 and 1600 meters."

To avoid a misrepresentation of the true vertical distribution of the temperature in the lower strata, caused by the rapid diurnal change to which the air temperature near the ground is subject in the morning hours, there is given for the base (40 meters) the temperature of the moment corresponding to that when the reading for the next interval of height (200 or 500 meters) is taken.

A graphic exhibit is founded on these readings and has been published regularly in the meteorological monthly, Das Wetter. [Figs. 1 and 2 are selected from the fifteen months given in the author's original pamphlet.—ED.]

The horizontal lines represent the heights for intervals of 100 meters, the light verticals are the limits of consecutive days. The heavier verticals correspond to the heights reached and the time of the ascents, the temperature at the different heights being represented as strictly simultaneous, although this, in fact, is not and naturally can not be the case. Still, in view of the comparatively short duration of the ascents when at the greater elevations, this inexactitude is but a trifling one, considering the small effect of the daily range at those heights. Equal temperatures were joined by isothermal lines, drawn for each 2° C., the intervening isotherms being added when necessary. The regular actual readings are represented by full isotherms, interpolated or extrapolated values by dotted lines. Additional observations taken by means of free or self-registering balloons are represented by dotted verticals up to a limit of 5500 meters shown by the size of the diagram. The lower and also the upper surfaces of clouds, where attained, are indicated by a $\underline{W}$ (lower) or $\overline{W}$ (upper surface) (W = Wolken, German for clouds) and occasionally by $\widetilde{cu}$ (cumuli).

The diagram represents the air temperature above Berlin during a period of fifteen months (October 1, 1902, until December 31, 1903); it appears to be so far the first and unique of its sort.[2] It shows only in its first three months a few lacunæ, caused by intervening Sundays and holidays; since 1903, these days have also been comprised in the regular work of the observatory. It establishes a clear picture of the change of temperature from day to day at different heights, and demonstrates the occasionally quite enormous oscillations therein. Likewise it demonstrates the unexpectedly frequent formation of thermal belts and inversions in their intensity and duration, as well as the bursting in of cold or hot "waves." It may be added that the daily range of temperature at the base has not been taken into account, since this would often have led to an illegible accumulation of the isothermal lines.

In order to facilitate the study of the distribution and change of temperature, all values lying above the freezing point have been pointed out in the plates by a light hachure, the limit thereof corresponding to the isotherm of 0° C. This isotherm will be found at an elevation of some 2200 meters on the 1st of October, 1902, but at 450 meters on the 2d, and on the ground on October 4, though the temperature was above the freezing point up to 550 meters. The cold wave or current which had descended from above and reached the ground on the 4th still prevails on the 6th at 500 meters, the air has grown warmer above this and beneath it; the 0° isotherm rises on the 7th to 2700 meters and sinks until the 20th in a series of oscillations to 1200, when it rapidly soars to 2600 meters, quickly to descend again to 1250 meters until the 22d. Until the 25th it rises more slowly to 2000 meters, sinks until the 28th to 1200, to wind the month up by two rapid oscillations between 2700 and 1050 meters, with some thermal discontinuities in the lower strata. Such are to be seen more particularlly in the first part of November, forming as it were "islands" of colder or warmer air, the freezing point line keeping high in the meantime (2800 to 2000 meters).

On November 14 there commences a frost period on the ground, while it yet continues to be warmer at 500 to 1000 meters. The prolonged period of frost, holding until December 15, shows only two breaks, from the 21st until the 27th, and on the 29th of November, when the 0° isotherm ascends to 1000 meters; but on December 12 there already appears in the higher state a decided warm wave, with temperatures above 0° (up to + 4° and more), while on the ground there are found 8° of frost. The warm wave reaches the ground on the 16th. A similar process is seen on December 22 and 23, with analogous formation of strata. Until January 12 the 0° line remains comparatively high (reaching 2500 meters), though with repeated considerable oscillations, but it then sinks to the ground to remain there until the 24th. On the 19th and 20th we find, between 1000 and 1500 meters, a pronounced inversion, minus 10° below and 0° above. An extraordinary rise of temperature at higher levels follows from the 24th until the 27th (+ 8° at 1500 meters!), the 0° line soars up to 3100 meters, and this again is followed by rapid cooling off, formation of thermal strata (February 1–10th), and cold waves on the 14–17th. From the 18th to the 19th the 0° line ascends from the ground to 2500 meters; at a height of 1400 meters there was a temperature of —12° on the 16th and one of + 6° on the 20th. The further course of our line until March 5 shows rapid and considerable oscillations, between 500 and 2500 meters, after which it slowly descends to the ground, touching it for the last time in the season on the 11th and 13th. Until March 23 it again keeps rising, accompanied by manifold thermal changes, and attains 2750 meters; a cold wave brings it down again on April 2–6 to 500 meters. On the 4th of April the isothermal lines below 0° are bent up rapidly and very steeply, but the 0° line does not take part in this to any degree. With numerous short changes this latter keeps comparatively low until April 21, from 200 to 700 meters, and ascends, after a rapid oscillation on the 22d–25th, until the end of the month, slowly but continuously, to attain, on May 3 and 4, 3200 meters. The "cold saints" of May 10–13, and again the 19th, show a fall to 1300 and 900 meters; the 15th and 16th an interesting inversion at 2000–2600 meters. From May 19 there

[2] See an earlier analogous diagram by L. Teisserenc de Bort in the Paris Comptes Rendus, August, 1899, and Monthly Weather Review, September, 1899.—ED.

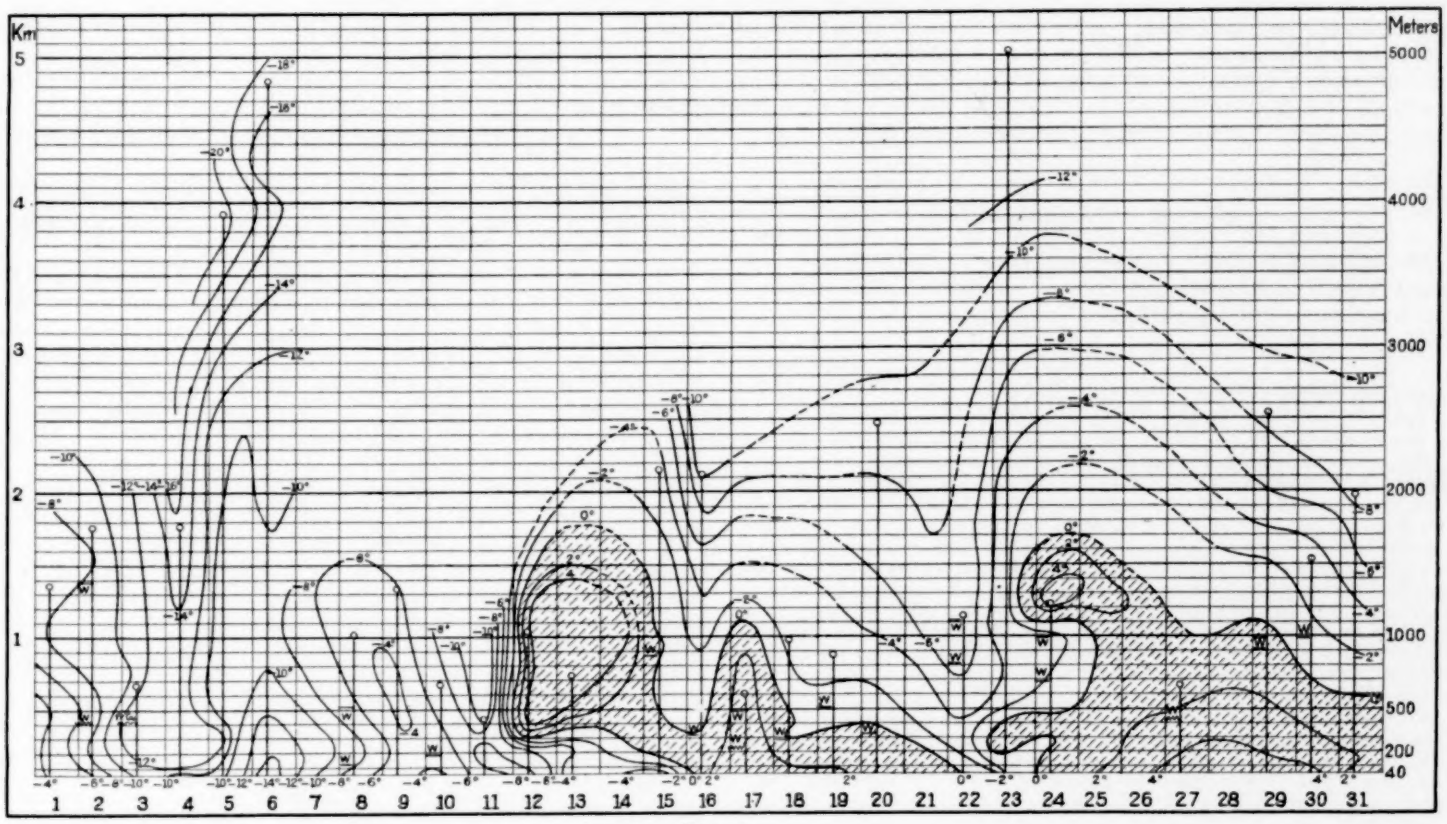

Fig. 1.

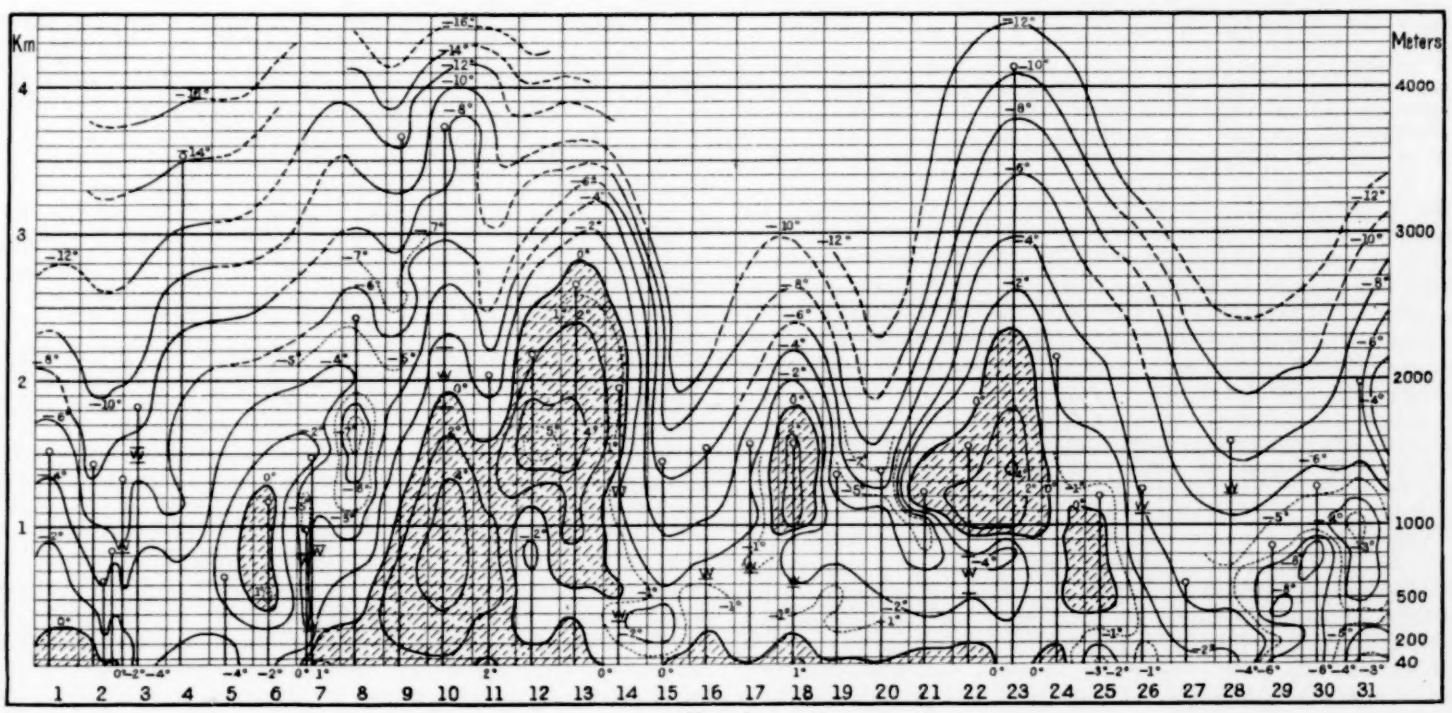

Fig. 2.

begins a considerable rise, attaining 3200 meters, followed, on June 3, by a redescending to 2250 meters. In June the mean elevation of the 0° line keeps high, between 3500 and 2200, and likewise in July and August, showing now larger shifts of height, between 2000 and 3000 meters, in nearly regular ten-daily periods. After a sudden descent of cold air down to 1500 meters, on August 30 there follows an extraordinary rise of the 0° line, reaching its annual extreme on September 3, with **5600** meters, which again was followed by a similarly rapid fall to 2800 meters by the 8th and to 1150 meters by the 12th. After that came considerable rise, to 3500 meters—18th until 20th—and up to 4000 meters on the month's last day, followed by a quick descent until the 3d of October, and a slow rise to 2800 by the 9th. With a series of considerable

oscillations between 2900 and 200 meters, combined with frequent inversions, our line sinks by the end of November and beginning of December to the ground. In December, 1903, there prevails a formation of warm strata up to 2000 meters, except on the days of 7–11th.

In presenting this first essay of a continuous study of temperature in the free atmosphere to our colleagues and to all friends of scientific aeronautics, we can not forbear to remark that it has been the result of hard work, done in all sorts of wind and weather, the execution of the ascents remaining chiefly in the hands of Professor Berson and Dr. Elias, besides the director and all the other members of the observatory.

NOTES AND EXTRACTS.

PLANETARY METEOROLOGY.

The following letter is an interesting illustration of the extent to which astrology still survives in the minds of those who have not kept up with the progress of civilization and education.

SAN DIEGO, CAL., *April 18, 1904.*

WILLIS L. MOORE,
Chief of Weather Bureau, Washington, D. C.

I beg to ask if it is contrary to your rules to allow inquiries and suggestions from the public if they do not become too frequent and embarrassing. Our weather at San Diego for some years past has been quite uncertain, due, as I assert, to the planetary changes and atmosphere. This year, or rather from last August up to February of this year, 1904, we have had more prolonged easterly winds than before in my experience of twenty years in San Diego County. As a result, the public are becoming more interested in astrological forecasts, and have been for the last few years. Having a large circle of friends who often inquire of me about the weather as I understand it from the moon phases, conjunctions, wind, etc., I have ventured to approach our Weather Bureau official a few times in the most respectful way, by way of inquiry, with a view to confirm or otherwise prevailing indications of coming changes, remarking that so many of the moon changes were close to noon, when I have been abruptly met with the remark from the forecast official, "We do not take any stock in such stuff as that." In conclusion, allow me to say while it is difficult to prognosticate weather in San Diego except by the instruments thirty-six hours ahead, there are numbers of farmers here who in the last few years have made more accurate forecasts based on astrology, moon changes, and unsettled, erratic wind currents than the Bureau of San Diego, and as a result many persons here are looking to Los Angeles. San Diego citizens are turning to Los Angeles Weather Bureau.

Yours, very respectfully,
(Signed) BENJAMIN JUDKINS.

Born June 20, 3 p. m., 1846. Sign Gemini; moon in Taurus; sun in conjunction with Mercury in the end of Gemini in △ to Saturn; R in beginning of Pisces; moon in Taurus at conjunction; Venus close star to Mars in Cancer; M. C. node 11° ascending M. 1°.

In connection with the above evidence of the continued existence of believers in astrology, we notice extracts from the San Diego newspapers lamenting the fact that southern California had no rain in October, November, and December, and no prospect of rain during January, although the local weather prophets, and even astrologers, living at a distance had promised considerable rain for the winter season. The editor of the San Diego Times says:

It failed to materialize, and we are thrown upon the Weather Bureau again with added experience in discounting old time signs as interpreted by that wonderful array of weather-wise men who annually find their way into print to demonstrate what they can not predict about the weather.

It certainly is a matter of surprise that there should be so many sensible men foolhardy enough to risk their reputation by attempting to make long-range weather forecasts when there is a reasonable certainty that they will thereby simply make themselves the laughing stock of the community.

What can the motive be, if not a mere desire for local notoriety? Surely a cautious man would make many private predictions and make sure of having a large percentage of verifications before beginning to publish. But these astrologers seem to keep no records, or at least ignore them, since every attempt to verify their work shows its utter unreliability.

Are they not monomaniacs—men of unbalanced minds, paradoxers, or possibly even quacks and fakirs?

One of the most persistent of the planetary forecasters says:

The papers that publish my forecasts are not edited by fools and the millions of families that read them are not so ignorant that they do not know what they want. The fact that they pay for my work is evidence that they closely examine it and have found it useful.

We think this enthusiast is mistaken. Newspaper editors are always willing to pay for whatever increases the popularity of their newspapers. They publish interesting matter that will, they think, catch the attention of the reader simply because it is news. They would like to have the reputation of publishing nothing but what is correct, reliable, and true, but this is almost an impossibility in many cases. So they publish nearly everything that comes handy, and leave it for the discreet reader to make his own selection.

Perhaps one million persons see the astrological forecasts, but do one hundred thousand read them with any care or attention, or find them useful? A forecast is useful only when a man actually makes some use of it, and really profits by its use. Our experience is that of the millions who read the daily forecasts of the Weather Bureau some rarely make any use of them, others do make use of them. Only a relatively small percentage of readers know how to put these forecasts to use or are able to alter personal business arrangements to suit the predicted weather. They ordinarily glance at the prediction. If it says "rain," they may pick up an umbrella which they would otherwise have neglected; if it says "fair weather," they may save themselves the trouble of carrying an umbrella. Only a small percentage of the Weather Bureau predictions relate to storms or extremely severe weather changes, such as would necessitate the rearranging of plans of work for the day. It must be very much the same way with the long-range astrological forecasts. Only those can be really useful that foretell such important matters as demand attention and foretell them in such a definite way that we know when and where they will occur. Unfortunately, the astrologer rarely or never does this, and, therefore, we think that his forecasts can not be really useful to the community. They, however, do serve as topics of conversation, to keep the subject of astrology always before the public, to stimulate credulity in the minds of those who admire and wonder at the wisdom of the learned seer. We remember very well that certain newspapers in Cincinnati supported the feeble beginnings of our work in forecasting by the assurance that the subject was one of such popular interest that they were quite willing to pay a certain sum annually (although I believe they were never called on to do it). Whether our predictions were verified or not was less important than the fact that we were about to make the trial, and everyone wished to see what we said.

A few years later in Washington we were approached by some of the brokers, operators, and gamblers who shove the prices of grain and stocks up and down, and were assured that a high price would be paid for special indications about the weather, as it was now forming a very important additional basis for their gambling operations. We refused to have anything to do with such use of the information in our possession, but we have lately noticed that some of the men who are now engaged in long-range forecasting for the daily newspapers are also going into the business of forecasting the crops and even the prices of crops. From this point of view, they and their colleagues "on 'change" may possibly think that their planetary forecasts are "useful," since whatever helps one to make a fortune or a living is useful to him. The Weather Bureau can not altogether prevent the misuse of its daily forecasts, but by making them free to the whole public

and by giving as wide a circulation as possible, it tries to put all citizens on the same basis, so that a designing speculator shall have as little advantage as possible over an honest and single-minded seller or producer.

WEATHER BUREAU MEN AS INSTRUCTORS.

The Editor would appreciate the courtesy if Weather Bureau men would kindly send him catalogues or announcements of their courses. This will enable him to state more fully and correctly the position of meteorology in the respective institutions.

Mr. George A. Loveland, Section Director, Lincoln, Nebr., has for some time been "instructor in astronomy and meteorology" at the University of Nebraska. On April 13 the board of regents of that institution adopted resolutions expressing their appreciation of Mr. Loveland's efficiency as an instructor. He offers courses in general meteorology, agricultural meteorology, and climatology. Recently Mr. Loveland has undertaken a detailed study of the climate of Nebraska as a part of his work in the graduate course looking to the degree of Ph. D. He will take up the subject in detail in its relation to ground water, topography, and geologic structure. Prof. G. E. Condra, of the department of geology, states that at present the most interesting subjects for investigation are to be found in our sand-hill region. "It will take the combined work of meteorologists, geographers, and geologists to solve the problems there."

We copy the following abstract of Mr. Loveland's courses from the Bulletin of the University of Nebraska, Series VIII, No. VIII:

1. *General meteorology.*—The earth's atmosphere, including such subjects as composition and extent, temperature, moisture, dew, frost, clouds, precipitation, winds, storms, with a study of weather maps, lectures, readings, and laboratory work in constructing weather maps and making forecasts. One hour attendance. One hour credit. First and second semesters.

2. *Agricultural meteorology.*—The earth's atmosphere. Attention is given to the subjects most valuable to agricultural students. Three hours attendance. Three hours credit. Second semester.

3. *Climatology.*—A laboratory course, including a study of meteorological instruments, their construction and errors; the equipment of an observing station; the organization and work of the weather services of the world; a study of climates, both local and general, with an extensive comparison of climates of different cities and countries. Must be preceded by course 1 or 2. One hour attendance. One hour credit. First and second semesters.

Meteorology is obligatory in certain elective groups of studies, but is elective in others. In the graduate school meteorology is considered as a minor for the degree of Ph. D.

Mr. Thomas J. Considine, Observer at Erie, Pa., lectured before the Boys' Club of that city on the formation of rain.

Mr. George E. Franklin, Local Forecaster at Los Angeles, Cal., reports that information relative to the work of the Weather Bureau, explanation of instruments, and short talks on elementary meteorology have been given to pupils of various schools, including the Harvard School, the Girls' Collegiate School, and the High School class in physical geography.

Mr. W. D. Fuller lectured at the High School on elementary meteorology and the work of the Bureau, and also addressed the Academy of Science on the same subjects.

Mr. F. P. Chaffee, Section Director at Montgomery, Ala., lectured before the Boys' High School of that city, January 23, 1904, on "The Weather Bureau and its work." He gave a general account of the work and methods of the Bureau, a description of the standard instruments, and an explanation of the laws of storms.

On February 26 he lectured on meteorology before the students and teachers of Starke's University.

Mr. P. H. Smyth, Observer at Cairo, Ill., delivered an address at that place on February 9, before the seventeenth annual convention of the county supervisors, commissioners, and clerks of the State of Illinois. His subject was, "The United States Weather Bureau and its value to commerce, agriculture, and navigation."

Mr. S. W. Glenn, Local Forecaster, reports that the summer school of the college at Huron, S. Dak., visited the Weather Bureau local office for instruction in meteorology on July 21, 1903. The summer school is composed largely of teachers from the surrounding country.

Mr. W. A. Shaw, Observer, Northfield, Vt., has recently completed a course of instruction to the senior class in Norwich University. The course covers a period of eleven weeks, two hours per week. For the past eight years the senior class has been required to take this course and the concluding examinations.

Mr. James H. Scarr, Observer, Sacramento, Cal., gave a short talk before the junior class of the Young Men's Christian Association of that city on April 16. The movement of storm centers was briefly explained, and the subject of California rainfall considered at some length.

On April 29 he addressed the debating society of the Young Men's Christian Association. He explained what the Weather Bureau does and does not do, and that at present there is no knowledge available that justifies us in indulging in long-range forecasts of the weather. Much interest was manifiested in his remarks and many questions were answered.

Mr. Ford A. Carpenter, Observer, San Diego, Cal., on March 11, lectured before the graduating class of the B street school on "Meteorology, a nature study." Some account was given of the Bureau and its work; local climatology was treated briefly, but special attention was given to suggesting the formation of habits of observation by observing the clouds, air currents as shown by smoke, etc., and resulting phenomena.

On May 6 he delivered an address before the class in physical geography of the National City, Cal., school on "Some characteristics of Pacific coast storms and their control of local climatic condition."

Mr. J. R. Weeks, Observer, Macon, Ga., under date of March 18, reports that he delivered a lecture, illustrated with stereopticon views, before the science department of Wesleyan Female College. He expects to repeat the lecture for the benefit of the entire college and the public.

On February 5 he delivered the first of a series of lectures on meteorology in the new science hall of Mercer University at Macon. It is hoped that meteorology will become a permanent feature of the course of instruction at the University, the necessity having been especially urged by Prof. W. E. Godfrey of the department of physics.

On April 7 Mr. Weeks delivered a lecture, illustrated by the stereopticon, to visiting teachers from Brunswick and Glynn counties, Ga.

Mr. R. H. Sullivan, Observer, Grand Junction, Mesa County, Colo., gave an exposition of meteorological apparatus and work before the class in physics of the local high school on March 18.

Mr. Bernard Bunnemeyer, Observer, Pensacola, Fla., delivered a series of lectures on meteorology before the three higher grades of public school No. 1 every alternate day during March. At the conclusion of the course the classes went to the Weather Bureau office in sections, and received instruction in the practical workings of the Bureau.

The pupils of the section on physiography of the State Normal School at Duluth, Minn., visited the office of the Weather Bureau February 25, and received instruction from Mr. H. W. Richardson, the local forecaster.

Mr. H. W. Grass, Assistant Observer, Moorhead., Minn., reports that on January 29 and February 9 the classes of the State Normal School, under Prof. H. M. Sanford, visited the office of the Weather Bureau and received instruction.

Mr. R. Q. Grant, Observer, La Crosse, Wis., reports as follows: January 15, a lecture on weather forecasting for the Nineteenth Century Club. Instruction in instruments and forecasting, February 17 and 18 for the scientific class of the La Crosse High School. March 9, lecture on weather signs, folklore, and the long-range forecasts in the almanacs, in Campbell, for the La Crosse County Agricultural and Horticultural Society. According to the local newspapers—

He not only gave a talk on the signs of the weather, but answered a continuous volley of questions, and was thus able to make the interview most instructive to all. Many of the farmers stoutly held out for the importance of folklore, but the weather man waged war ruthlessly, turning aside one argument after another, but giving due credit to those adages in which there is a foundation of fact. Belief in the ground hog, rheumatism, and the moon as weather indicators seems to have been effectually quashed.

March 15, explanation of Weather Bureau methods, at the Weather Bureau, for the Young Men's Club.

Mr. W. L. McKay, Assistant Observer at New York, reports that he has delivered public lectures on the Weather Bureau and meteorology as follows:

December 14, before the Chautauqua Circle of West Nyack.

December 18, February 15 and 25, in public school buildings, for the Board of Education of New York City.

March 4, before the Commonwealth Council of the Royal Arcanum, in Brooklyn, N. Y.

February 4, in Brooklyn, before an audience of several hundred school children and their parents. Mr. McKay sketched the history of the Bureau from its foundation, and explained the data on the weather map, detailing the methods by which reports are received and forecasts made. The lecture was illustrated with more than 100 lantern slides, and this method of illustration was used freely in all of the lectures.

Mr. Charles Stewart, Observer, Spokane, Wash., on April 19 lectured to 50 advanced pupils and their teachers at Brunot Hall, a school for young ladies, on "Weather changes and their causes." He also lectured to the 70 pupils of the physical geography class of Spokane High School, on meteorological instruments and kindred subjects. The class was divided into three sections and visited the local Weather Bureau office on April 27, 28, and 29.

METEOROLOGY IN THE UNIVERSITIES.

According to a copy of the Colorado Springs Daily Telegraph, Prof. H. F. Loud of Colorado College has been greatly encouraged by the gifts of General Palmer for the science of meteorology. An observing station has been completely equipped on the roof of Hagerman Hall, and there seems to be every prospect that this important station and its still more important mountain station on the summit of Pikes Peak will hereafter be occupied, and will afford the data for important researches. There are very few points in the world that lend themselves to the investigation of the atmosphere better than do Pikes Peak, Manitou, and Colorado Springs. In such work Colorado College may be expected to take an active part. Perhaps the first difficulty consists in the establishment and maintenance of continuous self registers at the college station, and this seems to have already been accomplished. We can but wish ultimate success to all the schemes in which Professor Loud is engaged for the benefit of research in meteorology.

We believe we have not before put on record the fact that a comprehensive course in meteorology is conducted by Prof. H. V. Egbert at Buchtel College, Akron, Ohio. It is an elective study in the department of mathematics, astronomy, and meteorology during the first half year, and occupies four hours each week. The course is thus described in the last circular of information:

Meteorology (Waldo).—A study of temperature, air pressure, winds, clouds, moisture, precipitation, atmospheric optics, and electricity; general, secondary, and special circulations of the atmosphere, weather and weather prediction, general climate and climate of the United States. In addition to the theoretical work the class will be required to conduct a series of meteorological observations after the methods of the United States Weather Bureau.

A new Weather Bureau station will be established about July 1 at Madison, Wis. It is hoped that the station will be located on the grounds of the University, and that a proper meteorological observatory will be built. Mr. James L. Bartlett, Observer, Weather Bureau, New York City, is designated as the observer in charge of the new station, and it is hoped that he will be able to give some instruction in meteorology at the University.

THE OBSERVATORY AT NICE.

The observatory at Nice, founded by R. Bischoffsheim, the wealthy banker of Paris, has suffered a severe loss in the death of its director, H. Perrotin. As his successor, General Bassot has been appointed. He is president of the International Geodetic Association and member of the Institute of France. As vice director, Mr. Simonin, who has hitherto been senior astronomer, has been appointed. Although the observatory is distinguished for its work in astronomy, yet it also cultivated meteorology and terrestrial magnetism.

HYPOTHESES AS TO THE CAUSE OF THE AURORA BOREALIS.

Referring to the hypotheses recently published by Mr. Charles Nordmann as to the cause of the aurora borealis (see MONTHLY WEATHER REVIEW, March, 1904, Vol. XXXII, p. 132), we note that in the Meteorologische Zeitschrift for April, Dr. T. H. Arendt, of the Central Meteorological Institute in Berlin, writes as follows:

Considering the fact that, especially in recent times, many persons have again labored to find some connection between the variable frequency of the sun spots, the variation in the solar activity, and the periodicity of certain meteorological elements, it may be proper to mention certain results of observations that Dr. Nordmann has himself brought together with great care.

The occurrence of solar eclipses has afforded opportunity for observations showing a close connection between the frequency of sun spots and the characteristic processes in the solar corona. At the time of sun-spot minimum the coronal streamers are especially frequent in the neighborhood of the solar equator, where they appear radial to the solar disk and with very considerable extension outward; as we approach the sun's pole their dimensions diminish and they curve toward the equator. During a sun-spot maximum these streamers are distributed more equally over the sun's disk and are everywhere smaller. Simultaneously the spectral lines of the gaseous components of the aurora are much brighter during sun-spot maxima and observable to a much greater distance from the sun's limb than during sun-spot minima. According to Nordmann, this gaseous layer in the sun's atmosphere receives its ability to send us light by its absorption of Hertzian waves. Furthermore, with reference to meteorologico-magnetic relations, Nordmann has made a brief summary that enables him to draw conclusions as to the velocity with which disturbances in the sun are transmitted to terrestrial conditions. For instance, in five well-known cases simultaneous observations as to the sudden occurrence of solar eruptions and magnetic disturbances show that the passage from the sun to the earth must take place with the velocity of light. Again, in another place Nordmann collects data from which it follows that the occurrence of a magnetic disturbance is simultaneous with the passage of a sun spot through the central meridian in only the rarest possible number of cases. These two latter results would certainly seem likely to entirely overthrow the hypotheses that refer the origin of auroras to the direct cathodic radiation from the sun. But, on the contrary, arguing from the experiments by Lenard, J. J. Thomson, Ebert, and Wiedemann, Nordmann is rather inclined to the idea that Hertzian waves proceeding from the sun do cause the auroras in our atmosphere.

It is well known that as early as 1896 Scheiner and Wilsig endeavored to solve the question whether energy comes to us from the sun in the form of electro-dynamic radiation; the measurements carried out in Potsdam led to no positive results. On the other hand, the occurrence of the great sun spot of October 31, 1903, which was accompanied by a great aurora and a remarkable magnetic disturbance, brought about no Hertzian waves in the lower strata of the atmosphere, as we know from the fact that the atmospheric or wireless telegraphy was not interfered with to any appreciable extent. In consideration of the fact that J. J. Thomson has suggested that the Hertzian waves would be absorbed to a large degree by the thin gases of our upper atmosphere, Nordmann decided to repeat the observations at much higher altitudes. Unfavorable weather prevented his work on the summit of Mont Blanc. It was, therefore, carried out in September, 1901, at the Bossons at an altitude of 3100 meters in accordance with the following method:

The receiver for the Hertzian waves consisted of a wire 5 millimeters in diameter and 175 meters long, isolated and so located on the earth that at midday the solar rays struck it normally to its length. The indicator for the possible Hertzian wave was a form of coherer that was placed inside of a vessel filled with quicksilver. The coherer was connected on the one hand with the above-mentioned wire receiver, and on the other hand with a well insulated wire inside the mercury; the wire led to a galvanometer and a LeClanche element, and then returned to contact with the mercury. If a Hertzian wave were present, a current would follow, but the experiments led to no decision.

According to Nordmann this was explained by the fact that at this time the sun had unusually few spots, and furthermore by the fact that at midday the altitude of the sun was too low. The author intends to repeat these observations in the course of the present year under more favorable conditions. The best chance for success would be to execute such observations during a high balloon voyage at the time of a great magnetic disturbance. It must surprise one that Nordmann did not delay the publication of his theory of the auroral light until he could obtain some more reliable basis for his ideas. The hypothetical character of his views is easily seen by the following simple statement of his train of thought.

Hertzian waves come from the sun; their intensity increases with the increased solar activity; in proportion to their intensity, they penetrate into our atmosphere to within 50 kilometers of the sea level and thus are absorbed, partly with the evolution of light; thereby the respective strata of air become electrically conductive, and if great potential differences exist electric currents are developed whose intensity varies with the physical conditions; the air that is made luminous gives occasion to the emanation of cathode rays which spread through space, thereby deciding the arrangement of the magnetic lines of force and the distribution of the electrostatic field. Rapid changes in the movement of the visible processes, namely the aurora, due to the absorption of the cathode rays in the air, are explained by the sudden changes, positive or negative, in the sign of the electrostatic field.

A more careful consideration of recent magnetic literature should have shown the author many objections, not only against the validity of his theory but also against his explanations of other magnetic questions.

CORRIGENDA.

MONTHLY WEATHER REVIEW for November, 1903, p. 526, column 2, line 4 above the second table, for "J. E. Keller" read "J. E. Keeler."

THE WEATHER OF THE MONTH.

By Mr. W. B. STOCKMAN, District Forecaster, in charge of Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and VI.

The mean barometer was generally high over the central and eastern districts and low over the southwestern. The crest of high mean pressure overlay Lake Superior, northern Minnesota, eastern North Dakota, and the contiguous Canadian territory. The area of low mean pressure overlay the middle and southern Plateau and slope regions, with the lowest mean readings reported from the upper Rio Grande Valley.

The mean pressure was below the normal in the Florida Peninsula and from central South Carolina northward over the lower Lake region and central New England, also in the north Pacific region; elsewhere it was above normal.

The negative departures were slight, not exceeding —.05 inch at any of the stations in the United States, while over the central half of the country from eastern Texas, northwestward and northeastward, the positive departures were quite marked and ranged from +.05 to +.16 inch, the maximum departure occurring in southeastern South Dakota.

Generally east of the eighty-seventh meridian, also in southern Arizona and extreme southern California, the mean pressure diminished from that of March, 1904; elsewhere it increased over March, 1904.

Over the eastern lower Lakes and the Atlantic States north of Georgia the minus changes were quite decided, ranging from —.05 inch in the southern and western portions of this area to —.15 inch over southern New England.

As a rule, the plus changes were greater than the minus. An area of changes amounting from +.10 to +.15 inch overlay the central slope districts, and a less extensive area, but with more decided changes, over the extreme northwestern districts, in which area the changes ranged from +.10 inch on the south and east to +.25 inch on the northwestern coast of Washington.

TEMPERATURE OF THE AIR.

The distribution of maximum, minimum, and average surface temperatures is graphically shown by the lines on Chart V.

Generally over the eastern two-thirds of the country and in interior California, Nevada, and western Arizona the temperature was below the normal.

Over almost the entire area where there was a deficiency in temperature the changes were marked, and ranged from —2.0° to —8.5°, the area of greatest deficiency overlaying the Ohio Valley, Tennessee, and the central Mississippi Valley, with the greatest changes in Missouri, where they ranged from —6.1° to —8.5°.

The plus departures were slight, and nowhere in the United States did they equal 4.0°. The previous highest mean temperature for the month of April since the establishment of the station was exceeded by 1° at Seattle and Tacoma, Wash., and by 4° at Lewiston, Idaho, and the lowest by 1° at Binghamton, N. Y., Fort Smith, Ark., Green Bay, Wis., Harrisburg, Pa., Lexington, Ky., Little Rock, Ark., Springfield, Ill., Sandusky, Ohio, Sioux City, Iowa, and Wichita, Kans.; by 2° at Columbus, Ohio, Concordia, Kans., and Evansville, Ind.; by 3° at

Kansas City and Springfield, Mo., and by 4° at Hannibal, Mo.

Maximum temperatures of 90°, or higher, were reported from southeastern Georgia, central Florida, Arizona, and southern California, and of 100°, or higher, from western Arizona and southeastern California.

The record of highest temperature during the month of April, since the establishment of the station, was exceeded by 1° at Jupiter, Fla.; by 2° at Eureka, Cal., and Tacoma., Wash.; 3° at Roseburg, Oreg., and 4° at Fort Worth, Tex.; and the lowest recorded temperature for any April by 1° at Elkins, W. Va.

Freezing temperatures occurred generally as far south as the thirty-fifth parallel and somewhat farther south over the Plateau region. Zero temperatures were reported from portions of southwestern Wyoming, northwestern Wisconsin, and extreme northern Maine.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	41.5	— 1.5	—14.5	— 3.6
Middle Atlantic	12	48.3	— 2.3	—15.7	— 3.9
South Atlantic	10	58.8	— 3.1	— 9.6	— 2.4
Florida Peninsula*	8	70.4	— 0.2	+ 2.5	+ 0.6
East Gulf	9	62.2	— 3.5	— 3.4	— 0.8
West Gulf	7	64.6	— 2.5	+ 5.6	+ 1.4
Ohio Valley and Tennessee	11	50.0	— 6.1	—12.6	— 3.2
Lower Lake	8	40.7	— 4.0	—18.4	— 4.6
Upper Lake	10	37.1	— 3.4	—18.5	— 4.6
North Dakota*	8	38.9	— 2.9	—15.5	— 3.9
Upper Mississippi Valley	11	45.9	— 5.2	—14.8	— 3.7
Missouri Valley	11	46.0	— 5.0	— 4.2	— 1.0
Northern Slope	7	45.2	+ 0.6	+ 5.4	+ 1.4
Middle Slope	6	51.9	— 2.3	+ 8.8	+ 2.2
Southern Slope*	6	60.4	— 0.7	+12.3	+ 3.1
Southern Plateau*	13	56.4	+ 0.5	+ 8.5	+ 2.1
Middle Plateau*	8	48.8	+ 1.1	+ 5.6	+ 1.4
Northern Plateau*	12	49.6	+ 3.0	+11.1	+ 2.8
North Pacific	7	51.3	+ 2.7	+ 1.3	+ 0.3
Middle Pacific	5	56.0	+ 1.5	— 0.1	0.0
South Pacific	4	59.4	+ 0.7	+ 2.8	+ 0.7

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Prof. R. F. Stupart says:

The mean temperature of April was higher than the average in British Columbia and Alberta and probably also in all the more northern Canadian Territory, while it was below average in Assiniboia, Saskatchewan, Manitoba, and from the Great Lakes eastward to the Maritime Provinces. Nearly the whole of British Columbia showed a positive departure of at least 3°, and the trend of the isotherms would indicate a still larger departure to the northward. At Dawson, Yukon, the mean temperature was 34°, being 4° above average. The largest negative departure, 6°, occurred in southwestern Ontario, near Lake Erie, whence northward and eastward the difference from average became less, and in the Ottawa Valley and thence to the Maritime Provinces it did not exceed 1° or 2°.

PRECIPITATION.

The distribution of total monthly precipitation is shown on Chart III.

The precipitation was above the average in New England, northern portion of the Middle Atlantic States, lower Lake region, eastern upper Lake region generally, west-central Minnesota, southern Iowa, southeastern Nebraska, northeastern Kansas, northern Missouri, the central portions of Illinois and Indiana, eastern Texas, extreme northern and the coast of central California, southwestern Idaho, eastern and central Washington, Oregon generally, and southern Florida; elsewhere there was a deficiency in precipitation.

Precipitation 2 inches, or more, in excess of the normal occurred in New England, west-central Minnesota, southern Iowa, southeastern Nebraska, northeastern Kansas, northern Missouri, and southeastern Texas, the greatest excess being reported from the last-named district, where it amounted to somewhat more than 8 inches.

Deficiencies of 2 inches, or more, were reported generally from the South Atlantic and east Gulf States, and the coast of Washington, the greatest deficiency, —3.8 inches, being reported from the last-named section.

The greatest amount of precipitation occurred in southeastern Texas, lower Missouri and central Mississippi valleys, and southeastern New England.

Measurable amounts of snowfall occurred generally as far south as the thirty-sixth parallel, except in western California.

Except at very high mountain points no snow remained on the ground at the end of the month.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	8	6.01	187	+2.8	+0.1
Middle Atlantic	12	2.34	70	—1.0	—4.3
South Atlantic	10	1.08	32	—2.3	—5.2
Florida Peninsula*	8	1.82	78	—0.5	+0.7
East Gulf	9	2.05	42	—2.8	—9.1
West Gulf	7	4.85	126	+1.0	—4.4
Ohio Valley and Tennessee	11	2.81	70	—1.2	—2.9
Lower Lake	8	2.62	113	+0.3	+3.1
Upper Lake	10	2.06	87	—0.3	—0.3
North Dakota*	8	1.55	79	—0.4	+0.3
Upper Mississippi Valley	11	3.27	110	+0.3	+0.2
Missouri Valley	11	3.50	121	+0.6	—0.1
Northern Slope	7	0.77	46	—0.9	—0.9
Middle Slope	6	1.86	86	—0.3	—1.4
Southern Slope*	6	1.08	47	—1.2	—2.9
Southern Plateau*	13	0.18	31	—0.4	—2.1
Middle Plateau*	8	0.82	80	—0.2	+1.3
Northern Plateau*	12	1.34	108	+0.1	+1.7
North Pacific	7	2.73	66	—1.4	+3.2
Middle Pacific	5	2.47	100	0.0	+6.1
South Pacific	4	1.32	100	0.0	—0.2

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Professor Stupart says:

The precipitation of the month was less than the average over the western half of the Dominion and very generally above average from Lake Huron to the Maritime Provinces, excepting in parts of eastern Quebec. In Saskatchewan it was almost nil, and in Alberta and western Assiniboia amounted to but a few tenths of an inch. In eastern Assiniboia and Manitoba it was somewhat greater, but in few localities did it reach the average. In Ontario and western Quebec, where the average was exceeded, it was mostly rain, but in all districts there were a few light snowfalls, and very much the same conditions obtained in the Maritime Provinces.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 1, 8, 16, 25, 26. Arkansas, 1, 7, 12, 13, 14, 15, 16, 22, 24, 25. California, 14, 15, 19, 20, 21, 22, 26, 27, 28, 30. Colorado, 29, 30. Connecticut, 2, 19. Delaware, 11. District of Columbia, 9. Florida, 6, 7, 9. Georgia, 1, 6, 8, 17, 26. Idaho, 16, 18, 19, 22, 27, 28, 29. Illinois, 1, 8, 11, 20, 23, 24, 25. Indiana, 1, 2, 8, 9, 10, 11, 12, 14, 20, 24, 25. Indian Territory, 12, 21, 30. Iowa, 11, 13, 15, 19, 20, 21, 22, 23. Kansas, 4, 19, 20, 21, 23, 24, 25, 30. Kentucky, 9, 10, 12, 25, 26. Louisiana, 1, 2, 7, 8, 9, 24, 25. Maine, 20. Maryland, 8. Massachusetts, 11, 19, 30. Michigan, 8, 9, 10, 11, 24. Minnesota, 7, 10, 11. Mississippi, 1, 7, 8, 9, 14, 16, 17, 20. Missouri, 8, 14, 16, 19, 20, 21, 22, 23, 24. Nebraska, 1, 19, 20, 21, 22, 23, 24, 25. Nevada, 3, 16, 17, 18, 19, 20, 21, 26, 29, 30. New Hamphire, 1, 11, 12. New Jersey, 2, 30. New York, 2, 3, 9, 10, 12, 16, 19, 30. North Carolina, 8, 12, 16, 20, 21, 26, 28. North Dakota, 10, 19, 20, 22, 29. Ohio, 1, 8, 9, 10, 11, 12, 24, 25, 26, 30. Oklahoma, 5, 6, 7, 21, 22, 23, 24. Oregon, 19, 21, 22, 27. Pennsylvania, 1, 9. Rhode Island, 1. South Carolina, 13, 16, 26. South Dakota, 18, 19, 21. Tennessee, 1, 14, 15, 16, 20, 21, 25, 26, 28. Texas, 1, 5, 7, 8, 14, 15, 16, 21, 22, 24, 25, 26, 29, 30. Utah, 1, 2, 6, 15, 19, 20, 23, 28. Virginia, 10, 16, 26,

27. Washington, 6, 14, 19, 21, 22, 29. West Virginia, 3, 8, 9, 10, 12, 23, 26. Wisconsin, 8, 23. Wyoming, 19, 23, 28.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 17. Arkansas, 9, 15, 16, 20. California, 19, 20, 21, 22, 26, 27. Colorado, 21. Connecticut, 19. Georgia, 17, 20. Idaho, 16, 27. Illinois, 1, 9, 12, 15, 20. Indiana, 9, 10, 11, 12, 20. Iowa, 7, 8, 9, 11, 12, 15, 19, 20, 21. Kansas, 8. Maine, 1, 12. Massachusetts, 1, 11, 14, 16, 19. Michigan, 1, 2, 8, 9, 10, 11, 15, 22. Minnesota, 1, 7, 8, 11, 12, 14, 22. Montana, 19, 24. Nebraska, 1, 3, 4, 8, 9, 11, 19, 20, 21, 22, 23, 24. Nevada, 3, 19, 20, 22, 23, 26. New York, 1, 2, 3, 10, 11, 12, 13, 14, 15, 16, 19, 20. North Carolina, 10, 17, 20, 28. North Dakota, 7, 8, 14, 19, 20, 21, 22. Ohio, 9, 10, 12. Oregon, 22, 30. Pennsylvania, 10, 11, 12. South Carolina, 20, 21, 26. South Dakota, 4, 7, 8, 11, 19, 20, 21. Tennessee. 9, 10, 13, 14, 16, 17, 20. Utah, 6, 20, 21, 22, 23. Vermont, 1, 2, 11. Virginia, 10, 16. Washington, 5, 6. West Virginia, 12. Wisconsin, 9, 11, 15.

CLEAR SKY AND CLOUDINESS.

The distribution of clear sky is graphically shown on Chart IV, and the numerical values of average daylight cloudiness, both for individual stations and by geographic districts, appear in Table I.

The cloudiness was above the average in the Atlantic and east Gulf States, Florida Peninsula, Ohio Valley and Tennessee, lower Lakes, North Dakota, and the middle slope and middle Pacific regions; elsewhere it was below the average.

The average cloudiness for the various districts, with departures from the normal, are shown in the following table:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.1	+ 0.8	Missouri Valley	4.7	— 0.7
Middle Atlantic	5.9	+ 0.7	Northern Slope	4.6	— 0.8
South Atlantic	4.8	+ 0.4	Middle Slope	4.9	+ 0.5
Florida Peninsula	4.2	+ 0.3	Southern Slope	3.6	— 0.6
East Gulf	5.0	+ 0.5	Southern Plateau	2.2	— 0.1
West Gulf	5.1	— 0.1	Middle Plateau	4.2	— 0.3
Ohio Valley and Tennessee	5.9	+ 0.6	Northern Plateau	5.0	— 1.3
Lower Lake	6.5	+ 1.0	North Pacific	6.3	— 0.2
Upper Lake	5.3	— 0.4	Middle Pacific	5.1	+ 0.5
North Dakota	5.7	+ 0.2	South Pacific	3.6	— 0.3
Upper Mississippi Valley	4.5	— 1.0			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 2498 thunderstorms were received during the current month as against 2677 in 1903 and 3289 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country was most numerous were: 24th, 249; 23d, 218; 25th, 188.

Reports were most numerous from: Missouri, 231; Texas, 201; Kansas, 145.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the dates of full moon, viz: March 27 to April 4, inclusive, and April 25 to May 3, inclusive.

In Canada: Thunderstorms were reported from Charlottetown, 30; Father Point, 12; Quebec, 9; Ottawa, 9, 30; Kingston, 9; Toronto, 9; Port Stanley, 1, 24; Saugeen, 24; Parry Sound, 9, 24; Medicine Hat, 29; Edmonton, 29; Hamilton, Bermuda, 4, 5, 19.

Auroras were reported from Quebec, 10; White River, 3, 19; Parry Sound, 3; Port Arthur, 17, 19; Winnipeg, 18, 19; Minnedosa, 13, 18; Swift Current, 7, 17, 18; Banff, 10; Edmonton, 1, 11, 13, 18, 19, 26; Prince Albert, 1, 2; Battleford, 2.

HUMIDITY.

The relative humidity was normal in the upper Mississippi Valley; above normal in New England, Ohio Valley and Tennessee, lower Lakes, North Dakota, and the northern slope, middle and northern Plateau, and north Pacific regions. In the remaining geographic districts its was below normal.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	77	+ 4	Missouri Valley	63	— 2
Middle Atlantic	66	— 1	Northern Slope	62	+ 4
South Atlantic	67	— 5	Middle Slope	56	— 1
Florida Peninsula	72	— 2	Southern Slope	53	— 2
East Gulf	69	— 1	Southern Plateau	27	— 3
West Gulf	69	— 3	Middle Plateau	47	+ 2
Ohio Valley and Tennessee	69	+ 4	Northern Plateau	64	+ 7
Lower Lake	77	+ 7	North Pacific	78	+ 7
Upper Lake	71	— 2	Middle Pacific	71	— 1
North Dakota	73	+ 5	South Pacific	66	— 2
Upper Mississippi Valley	68	0			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	24	57	nw.	New York, N. Y	16	73	nw.
Cairo, Ill	8	50	w.	Do	20	53	nw.
Cheyenne, Wyo	22	58	w.	North Head, Wash	2	50	s.
Chicago, Ill	24	53	sw.	Do	5	52	s.
Dodge, Kans	6	57	se.	Do	21	60	s.
Do	21	50	sw.	Do	23	60	se.
Duluth, Minn	1	58	nw.	Do	24	58	se.
Do	2	60	nw.	North Platte, Nebr	8	52	nw.
Do	8	54	ne.	Point Reyes Light, Cal	3	53	nw.
Do	11	50	ne.	Do	5	65	nw.
Eastport, Me	20	54	e.	Do	6	60	nw.
Fort Smith, Ark	8	52	w.	Do	18	60	se.
Green Bay, Wis	15	67	ne.	Do	19	52	w.
Hatteras, N. C	19	50	ne.	Do	21	50	nw.
Huron, S. Dak	8	51	nw.	Do	29	55	nw.
Jupiter, Fla	9	60	s.	Do	30	55	nw.
Knoxville, Tenn	25	50	w.	Pueblo, Colo	6	52	w.
Lincoln, Nebr	8	64	nw.	St. Louis, Mo	8	60	sw.
Do	9	50	nw.	Sand Key, Fla	30	50	sw.
Modena, Utah	19	53	sw.	Sioux City, Iowa	8	54	n.
Do	26	60	sw.	Do	11	56	nw.
Mount Tamalpais, Cal	6	53	nw.	Do	22	56	s.
Do	12	58	sw.	Springfield, Mo	8	54	w.
Do	21	54	nw.	Tatoosh Island, Wash	11	56	e.
Do	22	55	nw.	Do	22	51	s.
Do	23	55	nw.	Do	24	50	s.
New York, N. Y	12	50	w.	Williston, N. Dak	11	52	nw.

DESCRIPTION OF TABLES AND CHARTS.

By Mr. W. B. STOCKMAN, District Forecaster, in charge of Division of Meteorological Records.

For description of tables and charts see page 136 of REVIEW for March, 1904.

TABLE I.—*Climatological data for Weather Bureau stations, April, 1904.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01 or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.				
New England.							41.6	— 1.5											77	6.01	+ 2.8								6.1	
Eastport	76	69	82	29.88	29.97	+ .04	37.2	— 1.4	55	5	44	17	4	31	25	34	31	82		3.36	+ 0.3	12	8,089	sw.	54	e.	20	7	7	16	6.8	9.7
Portland, Me.	103	81	117	29.84	29.96	.00	40.2	— 2.8	60	5	47	22	4	34	28	36	31	74		7.51	+ 4.5	12	7,081	sw.	36	n.	20	7	9	14	6.2	9.9
Concord	298	70	79	29.63	29.96	— .03	41.6	— 2.7	67	25	51	22	14	32	36	...	...	...		7.44	+ 4.6	15	4,644	nw.	29	w.	2	6	12	12	6.3	10.0
Northfield	876	16	60	29.00	29.97	— .02	38.1	— 1.2	63	24	48	14	17	29	38	35	30	73		2.95	+ 0.9	14	6,311	s.	36	nw.	3	3	10	17	7.4	12.1
Boston	125	115	181	29.83	29.97	.00	44.6	— 0.5	70	30	53	26	4	37	32	40	33	68		9.14	+ 5.7	13	7,744	w.	32	ne.	27	10	8	12	5.5	1.4
Nantucket	12	43	82	29.95	29.96	— .01	42.8	— 0.3	56	29	48	27	20	38	19	40	39	89		4.08	+ 0.5	17	10,274	sw.	42	se.	1	5	15	16	6.5	T.
Block Island	26	11	46	29.94	29.97	— .01	42.2	— 1.2	60	25	48	26	20	36	21	39	36	82		5.31	+ 1.9	15	11,786	sw.	48	w.	20	8	13	9	5.4	1.6
Narragansett	.....	9	38	.....	.....	.....	42.0	— 2.2	60	25	50	22	17	34	26	...	...	...		7.69	+ 4.1	17	.....	se.	...	.....	...	11	8	11	...	0.5
New Haven	106	116	154	29.85	29.97	— .02	44.8	— 1.3	72	25	53	24	20	37	27	40	34	70		6.64	+ 3.1	13	7,715	nw.	40	nw.	16	13	10	7	4.5	T.
Mid. Atlantic States.							42.3	— 2.3											66	2.34	— 1.0								5.9	
Albany	97	102	115	29.87	29.98	— .02	43.6	— 2.4	70	30	52	24	20	35	32	38	34	72		2.87	+ 0.4	16	5,873	s.	28	se.	9	5	14	11	6.4	5.0
Binghamton	875	79	90	29.03	29.98	— .04	41.0	— 4.5	68	24	50	18	20	32	35	...	...	...		2.51	+ 0.2	16	5,820	w.	32	nw.	16	4	8	18	6.9	1.5
New York	314	108	350	29.63	29.97	— .03	46.4	— 1.7	73	25	54	25	20	39	24	40	33	65		3.94	+ 0.6	12	11,384	nw.	73	nw.	16	6	9	15	6.5	0.1
Harrisburg	374	94	104	29.59	29.99	— .03	46.7	— 3.4	76	25	55	26	20	39	27	41	33	61		2.07	— 1.4	12	6,387	nw.	39	w.	12	7	9	14	6.5	T.
Philadelphia	117	116	184	29.87	30.00	— .01	49.0	— 1.5	79	25	57	29	4	41	29	42	35	63		1.89	— 1.1	9	6,388	nw.	40	nw.	16	8	13	9	5.6	T.
Scranton	805	111	119	29.12	29.99	— .02	43.8	.....	70	25	52	22	20	35	35	39	32	66		2.32	.....	15	6,773	sw.	42	nw.	16	5	9	16	7.1	0.3
Atlantic City	52	39	48	29.93	29.99	— .01	45.8	— 1.0	68	25	53	25	4	39	31	41	36	73		3.09	— 0.2	10	6,208	nw.	32	ne.	27	7	11	12	6.2	T.
Cape May	17	47	51	29.99	30.01	+ .02	46.2	— 2.0	62	30	52	28	4	40	21	42	...	...		3.42	+ 0.3	11	6,445	nw.	30	nw.	19	7	15	8	5.6	
Baltimore	123	69	117	29.85	29.98	— .03	49.9	— 3.2	80	25	59	27	20	41	30	43	35	58		2.37	— 1.1	12	6,228	nw.	36	nw.	20	7	10	13	6.1	
Washington	112	59	76	29.88	30.00	— .02	49.7	— 3.3	81	25	59	28	15	40	32	44	36	63		2.98	— 0.4	12	5,918	nw.	36	nw.	19	15	6	9	4.4	T.
Cape Henry	18	11	58	29.97	29.99	— .01	54.2	— 0.4	85	26	62	32	4	46	31	...	...	...		0.81	— 3.6	9	10,438	se.	48	n.	19	10	15	5	4.7	
Lynchburg	681	83	88	29.24	29.98	— .04	52.2	— 3.7	82	25	63	27	17	41	39	45	38	63		0.97	— 2.4	7	3,857	nw.	24	nw.	19	11	12	7	5.1	
Norfolk	91	102	111	29.91	30.01	.00	55.4	— 0.8	84	26	65	33	4	46	33	48	42	65		1.13	— 2.9	9	7,364	s.	34	sw.	1	6	12	12	6.2	
Richmond	144	82	90	29.86	30.01	— .01	54.2	.....	84	25	64	29	4	44	35	...	...	...		1.57	.....	10	4,399	sw.	29	sw.	1	11	8	11	5.2	
Wytheville	2,293	40	47	27.61	30.02	— .01	46.5	.....	76	25	57	21	17	36	40	42	38	79		2.15	.....	14	4,817	w.	28	w.	19	8	9	13	5.9	0.5
S. Atlantic States.							53.8	— 3.1											67	1.08	— 2.3								4.8	
Asheville	2,255	53	75	27.66	30.01	— .02	49.2	— 5.4	75	25	60	26	5	39	39	42	36	66		1.64	— 1.4	8	6,920	nw.	32	nw.	16	5	13	12	6.1	3.0
Charlotte	778	68	76	29.18	30.03	.00	55.5	— 4.2	80	1	66	32	4	46	32	47	40	60		0.89	— 2.6	10	6,096	sw.	33	sw.	9	8	9	13	5.8	0.8
Hatteras	11	12	47	30.00	30.01	.00	58.2	+ 1.0	75	26	65	36	4	52	25	54	51	80		2.84	— 1.9	10	11,335	sw.	50	ne.	19	15	13	2	3.7	
Raleigh	376	71	79	29.61	30.02	— .01	56.3	— 2.5	84	25	67	31	5	46	35	49	42	63		0.29	— 3.0	9	5,334	sw.	26	sw.	1	9	14	7	4.7	
Wilmington	78	82	90	29.93	30.01	— .02	59.3	— 2.2	80	2	68	36	4	50	34	52	47	70		1.44	— 1.5	12	7,082	sw.	31	sw.	25	10	13	7	4.8	
Charleston	48	14	92	29.99	30.04	+ .01	61.8	— 2.8	87	16	70	42	4	54	36	54	48	67		0.17	— 3.4	3	8,569	sw.	34	ne.	16	10	15	5	4.6	
Columbia, S. C.	351	167	175	29.64	30.02	— .01	59.0	— 4.6	82	15	70	34	4	49	37	52	46	68		1.23	— 1.6	9	7,967	w.	37	ne.	4	7	15	8	5.5	
Augusta	180	89	97	29.83	30.03	.00	59.6	— 4.6	84	15	70	34	5	49	38	52	45	63		1.16	— 2.2	9	5,768	w.	32	w.	19	12	13	5	4.3	
Savannah	65	81	89	29.98	30.05	+ .02	63.2	— 2.9	87	16	72	43	4	54	33	54	48	65		0.35	— 3.1	3	6,666	sw.	27	w.	10	13	12	5	4.4	
Jacksonville	43	101	129	29.98	30.03	— .01	66.4	— 2.5	86	16	75	50	11	58	25	58	53	68		0.81	— 2.1	6	7,846	sw.	36	sw.	26	15	8	7	3.8	
Florida Peninsula.							72.9	— 0.2											72	1.07	— 0.4								4.2	
Jupiter	28	10	48	30.00	30.03	— .01	73.4	+ 1.4	89	21	80	54	11	66	22	66	63	75		2.85	+ 0.1	6	8,217	e.	60	s.	9	11	17	2	4.4	
Key West	22	10	53	29.99	30.01	— .01	75.2	— 0.9	84	8	80	66	30	71	15	68	64	72		1.51	+ 0.3	7	7,378	ne.	48	sw.	30	16	12	2	3.9	
Sand Key	25	40	71	29.97	30.00	.....	75.6	.....	87	18	79	63	30	72	16	...	...	...		0.48	.....	5	11,108	e.	50	sw.	30	10	13	7	4.8	
Tampa	34	60	67	30.00	30.04	— .02	70.1	— 1.0	88	20	80	54	14	61	28	61	57	69		0.66	— 1.7	3	4,969	w.	24	s.	7	17	9	4	3.5	
East Gulf States.							62.2	— 3.5											69	2.05	— 2.8								5.0	
Atlanta	1,174	190	216	28.79	30.04	+ .01	55.6	— 6.0	80	15	64	34	4	47	33	48	42	67		1.62	— 2.1	10	10,500	nw.	43	nw.	19	6	8	16	6.8	
Macon	370	93	99	29.65	30.04	+ .01	59.6	.....	84	15	70	36	5	49	38	...	...	...		0.99	.....	6	6,122	nw.	26	n.	16	11	4	15	5.8	
Pensacola	56	79	96	29.99	30.05	+ .03	65.7	— 2.0	79	21	72	46	4	59	22	...	...	...		1.08	— 2.4	3	8,064	nw.	39	sw.	9	18	10	2	2.9	
Birmingham	700	136	143	29.28	30.04	+ .02	58.7	— 5.5	82	15	69	34	4	49	29	...	...	...		2.02	— 4.2	13	7,207	sw.	33	sw.	25	8	12	10	5.7	
Mobile	57	88	96	29.99	30.05	+ .03	65.6	— 1.3	79	21	74	44	4	58	24	59	54	73		1.21	— 3.5	2	6,218	s.	26	nw.	8	11	17	2	4.1	
Montgomery	223	100	112	29.80	30.03	.00	62.1	— 3.3	84	1	72	36	4	52	33	54	49	68		1.82	— 3.0	5	6,138	sw.	28	w.	8	7	15	8	5.6	
Meridian	375	84	93	29.64	30.04	+ .02	60.4	— 5.2	84	15	72	35	4	49	35	...	...	...		3.11	— 1.3	8	4,975	sw.	26	se.	25	11	11	8	4.9	
Vicksburg	247	62	74	29.76	30.02	+ .02	62.4	— 3.4	84	23	72	41	4	53	27	54	49	68		3.57	— 2.3	9	5,897	s.	29	nw.	9	10	7	13	5.4	
New Orleans	51	88	121	29.99	30.04	+ .04	67.4	— 1.6	83	21	76	46	10	59	25	60	54	69		1.94	— 3.2	5	6,807	se.	37	se.	25	13	12	5	4.0	
West Gulf States.							64.6	— 2.5											69	4.85	+ 1.0								5.1	
Shreveport	249	77	84	29.75	30.02	+ .05	63.2	— 3.2	85	20	73	41	17	53	33	55	49	67		3.45	— 1.8	8	5,962	se.	28	ne.	16	14	8	8	4.5	
Fort Smith	457	79	94	29.52	30.00	+ .04	57.6	— 4.6	81	11	68	38	13	48	37	49	41	61		2.39	— 2.7	7	8,459	e.	52	w.	8	5	18	7	5.3	
Little Rock	357	93	100	29.65	30.03	+ .05	58.0	— 5.2	82	11	67	36	10	49	38	49	42	61		3.68	— 1.1	11	6,703	ne.	35	sw.	8	9	8	13	5.8	
Corpus Christi	20	48	53	29.95	29.97	+ .02	71.4	+ 0.1	84	25	77	50	10	66	28	66	64	80		5.15	+ 3.6	7	10,102	se.	40	ne.	2	6	12	12	5.6	
Fort Worth	670	106	114	29.30	30.01	+ .07	64.0	.....	95	11	74	41	17	54	42	...	...	...		2.21	.....	7	9,463	s.	43	nw.	7	15	12	3	4.1	
Galveston	54	106	112	29.97	30.03	+ .06	68.6	— 1.0	78	24	73	49	10	64	20	64	61	80		11.04	+ 8.2	9	9,710	s.	38	se.	21	15	10	5	4.0	
Palestine	510	73	79	29.49	30.02	+ .06	65.6	— 3.1	85	20	73	41	*	55	35	56	52	71		5.02	+ 0.4	14	6,530	s.	36	nw.	22	10	7	13	5.7	
San Antonio	701	80	91	29.24	29.96	+ .03	69.6	— 0.5	92	20	80	42	10	59	38	60	54	66		3.25	+ 0.3	6	6,408	se.	36	nw.	1	9	13	8	4.9	
Taylor	583	55	63	29.38	29.99	+ .04	66.4	.....	91	20	78	40	10	55	41	...	...	...		3.62	.....	9	8,616	s.	36	se.	21	7	8	15	6.1	
Ohio Val. and Tenn.							50.0	— 0.1											69	2.31	— 1.2								5.9	
Chattanooga	762	106	112	29.24	30.06	+ .03	55.0	— 5.9	80	25	65	32	4	45	40	46	39	60		1.67	— 2.8	10	7,046	sw.	36	sw.	8	8	11	11	6.1	
Knoxville	1,004	35	88	28.96	30.03	.00	52.4	— 5.8	79	25	62	27	21	42	37	45	38	65		1.90	— 3.0	11	6,744	sw.	50	w.	25	9	10	11	5.3	3.5
Memphis	397	146	154	29.63	30.06	+ .06	56.0	— 6.1	78	23	64	35	16	48	26	50	45	70		3.79	— 1.7	12	7,339	nw.	41	sw.	25	10	10	10	5.6	
Nashville	546	122	134	29.46	30.05	+ .04	53.6	— 6.2	81	11	63	30	4	44	45	46	41	68		2.35	— 2.4	12	6,449	nw.	36	s.	1	10	11	9	5.4	T.
Lexington	989	75	102	28.94	30.02	.00	47.8	— 8.1	76	23	56	27	4	39	34	...	...	...		3.08	— 0.6	15	8,999	sw.	44	s.	1	11	7	12	5.8	1.5
Louisville	525	114	136	29.46	30.04	+ .03	51.0	— 5.4	81	23	60	31	4	42	33	46	42	74		2.67	— 1.8	12	7,326	sw.	37	sw.	11	8	10	12	6.1	T.
Evansville	431	72	82	29.55	30.02	+ .02	51.2	.....	79	23	60	27	20	43	29	...	...	...		3.67	.....	10	5,936	w.	34	sw.	25	8	15	7	5.1	3.0
Indianapolis	822	154	164	29.13	30.03	+ .03	46.4	— 6.5	78	23	55	25	20	38	28	41	35	69		5.53	+ 1.8	9	9,099	n.	44	s.	8	14	5	11	5.1	T.
Cincinnati	628	152	160	29.34	30.03	+ .02	48.2	— 6.4	77	23	57	26	20	40	30	42	35	63		2.28	— 0.9	10	6,314	sw.	31	w.	25	7	7	16	6.7	T.
Columbus	824	173	190	29.13	30.01	— .01	45.0	— 6.2	75	23	53	22	20	37	32	40	36	73		2.49	— 0.7	16	9,227	sw.	46	w.	15	7	8	15	6.6	0.9
Pittsburg	842	116	123	29.08	30.00	— .02	46.4	— 4.8	76	24	55	23	14	38	30	41	36	70		3.02	+ 0.2	20	4,345	nw.	24	nw.	15	7	7	16	6.6	1.3
Parkersburg	638	77	84	29.35	30.04	+ .01	48.0	— 5.8	76	24	57	25	4	39	34	43	38	72		2.12	— 0.8	18	4,898	sw.	39	w.	1	11	9	10	5.2	T.
Elkins	1,940	41	50	27.93	29.99	— .04	44.6	.....	77	24	56	17	4	34	45	40	36	78		3.06	.....	18	3,915	n.	25	s.	9	6	10	14	7.0	5.1
Lower Lake Region.							40.7	— 4.0											77	2.62	+ 0.3								6.6	
Buffalo	767	178	206	29.15	29.99	— .02	38.8	— 2.9	66	24	45	20	20	32	30	35	31	77		2.79	+ 0.3	18	11,194	sw.	48	sw.	12	5	6	19	7.2	13.9
Oswego	335	76	91	29.60	29.98	— .03	39.2	— 3.1	69	24	46	22	19	32	26	36	33	80		2.81	+ 0.7	16	8,717	w.	40	n.	16	8	5	17	6.3	11.2
Rochester	523	81	102	29.41	30.00	— .01	40.4	— 3.1	71	24	48	18	15	33	26	36	32	77		3.50	+ 1.0	17	7,347	w.	33	w.	2	6	4	20	6.9	19.5
Syracuse	597	97	113	29.32	29.98	— .03	40.8	.....	68	24	48	20	20	34	27	...	...	...		3.20	.....	20	9,988	nw.	42	w.	19	5	11	14	6.6	11.2
Erie	713	92	102	29.22	30.00	— .02	40.2	— 3.9	70	24	46	23	20	34	26	36	33	78		2.83	+ 0.3	19	8,530	nw.	45	s.	8	8	4	18	6.8	1.7
Cleveland	762	190	201	29.18	30.01	— .01	40.8	— 4.9	72	23	47	23	20	35	29	37	34	78		2.76	+ 0.5	22	11,427	nw.	44	n.	16	9	4	17	6.5	1.0
Sandusky	629	62	70	29.31	30.01	— .01	42.1	— 4.9	74	23	48	25	17	36	26	...	...	...		2.89	+ 0.4	16	7,225	ne.	32	w.	2	12	6	12	5.5	0.1
Toledo	628	120	127	29.32	30.02	+ .01	43.0	— 4.5	76	23	50	22	20	36	29	38	32	70		1.77	— 0.4	14	8,311	w.	37	ne.	25	8	7	15	6.0	T.
Detroit	730	153	193	29.20	30.01	— .01	41.2	— 4.5	73	23	48	22	20	34	31	37	33	77		1.65	— 0.6	15	9,219	sw.	37	ne.	27	7	4	19	6.7	1.8
Upper Lake Region.							37.1	— 3.4											71	2.06	— 0.3								5.3	
Alpena	609	63	80	29.36	30.04	+ .02	36.0	— 1.1	65	30	44	16	16	28	27	32	28	75		2.64	+ 0.5	13	8,452	n.	40	e.	8	8	11	11	5.7	7.8
Escanaba	612	40	48	29.40	30.08	+ .06	35.2	— 0.6	66	29	43	14	20	27	29	31	26	74		2.02	— 0.1	9	6,542	n.	33	ne.	8	11	5	14	5.3	0.9
Grand Rapids	707	127	165	29.25	30.03	+ .02	40.9	— 6.1	78	23	50	20	20	32	29	36	30	70		2.37	+ 0.2	8	9,086	nw.	42	sw.	24	11	7	12	5.4	3.2
Houghton	668	66	74	29.35	30.10	+ .08	34.1	.....	66	30	42	14	21	26	33	...	...	...		1.58	.....	11	5,413	w.	25	w.	16	14	9	7	4.0	7.6
Marquette	734	76	116	29.28	30.10	+ .08	34.6	— 2.6	66	23	41	18	3	28	27	31	24	67		0.89	— 1.1	8	7,788	nw.	36	s.	23	13	4	13	5.2	4.1
Port Huron	638	70	120	29.32	30.03	+ .01	37.6	— 4.1	71	23	44	18	17	31	29	35	31	78		3.23	+ 1.1	12	9,807	n.	41	nw.	12	6	9	15	6.5	12.0
Sault Ste. Marie	614	40	61	29.34	30.02	— .01	34.6	— 3.1	69	30	43	12	3	26	34	30	24	69		2.03	+ 0.4	8	6,947	nw.	35	nw.	12	14	6	10	4.6	0.6
Chicago	823	241	274	29.15	30.05	+ .05	40.7	— 4.9	79	23	47	23	16	34	28	36	31	72		3.01	— 0.1	10	13,081	ne.	53	sw.	24	9	9	12	5.7	T.
Milwaukee	681	124	142	29.30	30.06	+ .07	39.6	— 3.1	69	23	46	20	16	33	32	35	31	74		1.79	— 1.1	7	9,471	n.	45	ne.	8	10	7	13	5.7	3.7
Green Bay	617	49	86	29.38	30.06	+ .05	37.8	— 5.2	75	23	46	14	16	30	33	33	27	69		2.07	— 0.5	10	9,034	ne.	67	ne.	15	10	7	13	5.7	11.8
Duluth	1,133	11	47	28.85	30.10	+ .09	34.2	— 2.8	60	30	41	15	12	27	27	30	22	66		0.50	— 1.9	8	11,031	ne.	60	nw.	2	12	11	7	4.4	3.1

TABLE I.—*Climatological data for Weather Bureau stations, April, 1904*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
North Dakota.							**38.6**	**— 3.4**											**73**	**2.26**	**+ 0.3**								**5.7**	
Moorhead	935	54	60	29.07	30.12	+ .13	37.2	— 4.1	74	30	44	16	16	30	29	34	30	81	4.62	+ 2.4	9	8,529	se.	35	nw.	1	8	7	15	6.3	17.4
Bismarck	1,674	16	29	28.26	30.08	+ .11	40.4	— 1.7	83	28	50	15	16	30	33	34	28	66	1.38	— 0.9	6	10,473	n.	44	n.	11	12	9	9	4.9	7.5
Williston	1,875	14	44	28.04	30.06	+ .10	38.1	— 4.5	87	28	48	15	15	28	45	33	28	73	0.78	— 0.6	7	8,580	se.	52	nw.	11	9	7	14	5.8	2.6
Upper Miss. Valley.							**45.9**	**— 0.2**											**68**	**3.27**	**+ 0.3**								**4.6**	
Minneapolis		99	208				41.0	— 6.1	73	30	49	21	16	33	32					1.83	— 1.0	11	10,197	n.	45	n.	8	10	9	11		7.8
St. Paul	837	102	122	29.14	30.06	+ .07	41.9	— 3.3	75	30	50	21	16	34	30	36	29	67	1.74	— 0.7	9	6,493	nw.	34	nw.	1	15	7	8	4.3	10.2
La Crosse	714	71	87	29.27	30.06	+ .08	43.8	— 3.6	76	30	52	23	3	35	30				1.35	— 0.9	9	6,735	n.	36	ne.	8	15	7	8	4.4	1.0
Davenport	606	71	79	29.36	30.01	+ .03	45.6	— 4.1	80	23	55	24	16	36	31	39	33	65	2.05	— 0.7	6	6,819	ne.	35	ne.	25	13	9	8	4.3	T.
Des Moines	861	84	99	29.13	30.07	+ .10	45.4	— 5.1	74	30	55	26	3	36	31	40	33	66	5.48	+ 2.7	9	7,394	nw.	36	s.	23	8	13	9	5.2	0.2
Dubuque	698	100	117	29.29	30.05	+ .07	44.3	— 4.3	79	23	54	24	16	35	33	39	33	69	2.05	— 0.7	8	6,561	nw.	34	nw.	15	17	5	8	4.3	1.5
Keokuk	614	63	78	29.35	30.02	+ .04	47.0	— 5.0	81	23	56	28	16	38	28	40	34	67	5.11	+ 1.9	9	7,373	n.	38	nw.	15	15	9	6	4.0	T.
Cairo	356	87	93	29.66	30.05	+ .06	52.6	— 6.3	77	23	61	33	20	44	31	46	40	68	2.98	— 0.9	9	8,696	n.	50	w.	8	3	18	9	6.0	
Springfield, Ill.	644	82	93	29.33	30.03	+ .05	46.8	— 6.6	80	23	56	28	21	38	29	40	34	67	4.81	+ 1.1	10	8,693	n.	33	s.	8	12	11	7	4.6	0.1
Hannibal	534	75	109	29.43	30.01	+ .03	47.6	— 6.1	79	23	56	28	17	39	28				5.35	+ 2.6	11	8,594	sw.	47	s.	23	15	11	4	3.6	8.5
St. Louis	567	208	217	29.41	30.02	+ .04	49.2	— 7.0	79	23	58	28	20	41	27	44	40	77	3.25	— 0.5	11	9,676	se.	60	sw.	8	13	9	8	4.7	5.5
Missouri Valley.							**46.0**	**— 5.0**											**63**	**3.50**	**+ 0.6**								**4.7**	
Columbia, Mo	784	11	84	29.19	30.03	+ .05	47.9	— 8.5	79	23	58	27	17	38	32					7.35	+ 4.4	9	7,921	n.	40	sw.	8	14	8	8	4.6	1.8
Kansas City	963	78	95	29.01	30.06	+ .10	49.0	— 5.4	76	22	58	30	16	40	26	43	37	68	6.69	+ 3.8	10	6,915	nw.	32	nw.	9	15	7	8	4.0	3.0
Springfield, Mo	1,324	98	104	28.61	30.03	+ .06	50.9	— 7.5	75	22	59	31	9	41	31	43	37	68	3.71	— 0.1	13	9,736	nw.	54	w.	8	16	6	8	4.5	1.5
Topeka		85	89				49.1	— 7.7	77	22	60	28	16	38	35				4.70	+ 2.0	11	8,741	se.	42	nw.	8	12	11	7	4.7	2.1
Lincoln	1,189	75	84	28.75	30.04	+ .10	45.4	— 6.0	74	30	56	21	16	35	34	38	30	62	5.11	+ 2.5	10	11,264	nw.	64	nw.	8	13	7	10	4.7	1.0
Omaha	1,105	115	121	28.85	30.05	+ .10	45.8	— 5.2	73	30	55	24	16	36	32	38	30	60	3.20	+ 0.1	9	9,177	n.	46	nw.	8	15	4	11	4.8	0.5
Valentine	2,598	47	54	27.32	30.06	+ .12	44.5	— 2.7	78	14	57	16	16	32	43	36	26	56	0.40	— 2.4	2	9,333	nw.	44	n.	8	15	7	8	4.7	4.0
Sioux City	1,135	96	164	28.83	30.06	+ .11	43.9	— 4.1	75	30	55	20	16	33	40				2.32	— 0.7	6	12,705	nw.	56	nw.	11	11	7	12	5.5	2.5
Pierre	1,572	43	50	28.38	30.07	+ .12	45.0	— 1.3	82	*	58	14	16	32	41	36	27	57	0.87	— 1.1	5	8,489	nw.	40	nw.	11	12	7	11	4.9	1.5
Huron	1,306	56	67	28.65	30.07	+ .11	41.3	— 3.1	79	29	54	14	16	29	48	35	28	68	2.22	— 0.7	8	12,357	se.	51	nw.	8	12	9	9	5.3	9.6
Yankton	1,233	42	49	28.77	30.11	+ .16	43.7	— 3.0	78	30	56	16	16	32	46				1.89	— 1.2	7	8,271	nw.	37	nw.	11	17	5	8	4.4	2.3
Northern Slope.							**45.2**	**+ 0.6**											**62**	**0.77**	**— 0.9**								**4.6**	
Havre	2,505	11	44	27.36	30.02	+ .09	44.6	+ 0.6	76	27	58	20	15	31	46	38	32	66	0.34	— 0.6	4	6,598	e.	37	sw.	10	15	8	7	4.4	0.4
Miles City	2,371	42	50	27.46	29.99	+ .03	47.6	+ 1.0	78	27	60	22	15	35	42	42	39	78	0.06	— 1.0	1	5,430	nw.	30	w.	6	15	11	4	4.0	
Helena	4,110	88	94	25.80	30.00	+ .03	47.1	+ 3.6	77	12	58	17	16	36	40	37	27	50	0.18	— 0.9	5	6,465	sw.	35	n.	14	12	11	7	4.5	0.5
Kalispell	2,965	45	51	26.92	29.99	+ .03	45.8	.....	72	26	58	22	1	34	38	38	30	60	0.70	.....	6	4,309	w.	25	sw.	6	21	4	5	3.1	
Rapid City	3,234	46	50	26.60	30.01	+ .06	44.2	— 2.4	78	28	57	17	16	32	46	38	31	66	0.43	— 1.8	4	8,031	nw.	37	nw.	8	13	8	9	5.0	0.3
Cheyenne	6,088	56	64	23.98	30.00	+ .09	41.5	+ 0.6	72	13	55	15	9	28	42	33	24	58	1.80	+ 0.4	11	8,667	nw.	58	w.	22	6	11	13	6.4	7.9
Lander	5,372	26	36	24.62	29.99	+ .05	44.3	+ 2.3	76	27	59	10	1	29	46	36	27	58	1.05	— 1.6	5	3,567	sw.	36	sw.	19	10	14	6	4.7	1.8
Yellowstone Park	6,200	11	47	23.86	30.03	+ .07	38.7	.....	69	27	51	10	1	26	39	30	22	59	0.96	.....	9	4,975	sw.	30	nw.	6	14	11	5	4.3	7.0
North Platte	2,821	43	52	27.10	30.04	+ .12	47.4	— 1.2	81	14	62	21	16	33	51	39	31	60	1.52	— 0.6	7	9,844	nw.	52	nw.	8	9	15	6	5.2	
Middle Slope.							**51.0**	**— 2.3**											**66**	**1.86**	**— 0.3**								**4.9**	
Denver	5,291	79	151	24.69	29.95	+ .05	49.4	+ 2.5	78	13	62	22	9	37	41	40	31	56	0.74	— 1.3	6	6,857	n.	41	ne.	24	8	13	9	5.6	2.4
Pueblo	4,685	80	86	25.25	29.94	+ .06	50.4	— 0.1	81	20	65	23	16	36	45	38	24	45	0.25	— 1.2	3	6,542	se.	52	w.	6	11	15	4	4.4	0.2
Concordia	1,398	42	47	28.55	30.04	+ .11	49.0	— 6.3	78	22	60	27	16	38	40	41	34	62	4.50	— 2.2	11	7,535	se.	38	nw.	8	12	8	10	5.0	T.
Dodge	2,509	44	54	27.40	30.01	+ .11	51.9	— 1.8	86	21	66	26	17	38	47	42	32	56	1.54	0.0	9	10,340	se.	57	se.	6	10	12	8	5.2	
Wichita	1,358	78	86	28.59	30.03	+ .10	52.7	— 5.1	80	22	64	31	16	42	41	44	36	62	2.65	— 0.3	10	8,115	se.	43	nw.	8	11	11	8	4.6	T.
Oklahoma	1,214	79	86	28.70	29.98	+ .06	58.0	— 3.0	90	20	69	35	16	47	45	48	39	55	1.51	— 1.2	9	10,085	se.	48	sw.	24	9	13	8	4.8	
Southern Slope.							**59.7**	**— 0.6**											**53**	**0.78**	**— 1.4**								**3.6**	
Abilene	1,738	45	54	28.16	29.95	+ .05	64.0	— 1.3	94	15	76	37	17	52	40	53	45	59	0.93	— 1.8	7	8,152	se.	37	se.	23	14	7	9	4.6	
Amarillo	3,676	10	49	26.24	29.95	+ .08	55.4	+ 0.1	88	20	68	29	16	42	43	43	30	47	0.63	— 1.1	5	11,739	se.	57	nw.	24	22	6	2	2.7	T.
Southern Plateau.							**59.7**	**+ 0.1**											**27**	**0.03**	**— 0.5**								**2.2**	
El Paso	3,762	10	110	26.14	29.86	+ .03	64.8	+ 1.0	89	19	80	38	22	49	47	44	16	20	0.00	— 0.2	0	8,984	e.	44	w.	28	22	8	0	1.8	
Santa Fe	7,013	47	50	23.23	29.89	+ .05	49.4	+ 2.8	72	14	62	25	9	37	34	34	14	28	0.05	— 0.7	2	6,353	se.	36	sw.	23	23	6	1	2.1	T.
Flagstaff	6,907	12	25	23.32	29.88	+ .04	44.2	— 2.6	75	12	61	12	24	27	46	32	16	38	0.11	— 1.4	2	7,283	sw.	48	sw.	23	22	8	0	2.1	0.1
Phoenix	1,108	50	56	28.73	29.87	.00	68.0	+ 1.0	96	10	85	37	1	51	44	47	22	20	0.00	— 0.3	0	3,517	e.	25	sw.	20	24	5	1	1.7	
Yuma	141	16	46	29.74	29.89	.00	69.7	— 0.4	100	13	87	42	3	53	47	52	34	32	T.	— 0.1	0	5,082	w.	29	n.	5	27	2	1	1.0	
Independence	3,910	51	58	25.94	29.91	+ .01	56.2	— 1.1	81	12	68	31	20	44	31	40	18	24	T.	— 0.2	0	6,687	nw.	42	se.	26	13	9	8	4.2	
Middle Plateau.							**49.4**	**0.0**											**47**	**0.72**	**— 0.4**								**4.2**	
Carson City	4,720	82	92	25.25	29.98	+ .01	45.7	— 2.3	79	12	59	23	24	33	43	37	29	59	0.20	— 0.7	2	5,697	sw.	33	sw.	18	13	10	7	4.1	0.1
Winnemucca	4,344	59	70	25.59	29.98	+ .02	46.9	— 0.4	80	12	60	23	23	34	39	39	30	40	0.24	— 0.7	6	7,617	sw.	41	sw.	19	16	3	11	4.7	T.
Modena	5,479	10	43	24.58	29.93	+ .05	46.0	.....	77	12	61	23	8	31	44	35	20	43	0.02	.....	1	9,182	sw.	60	sw.	26	17	12	1	3.3	0.3
Salt Lake City	4,366	105	110	25.58	29.95	+ .03	50.4	+ 0.9	78	14	61	30	7	40	29	40	28	46	2.20	0.0	7	5,185	nw.	37	se.	19	12	7	11	5.0	6.0
Grand Junction	4,608	43	51	25.33	29.90	+ .02	54.8	+ 1.6	81	14	68	29	7	42	36	42	31	46	0.26	— 0.4	4	4,710	nw.	34	nw.	6	14	14	2	4.0	T.
Northern Plateau.							**51.6**	**+ 2.2**											**64**	**1.34**	**0.0**								**5.0**	
Baker City	3,471	53	59	26.43	30.02	+ .02	47.4	+ 2.8	79	13	58	27	7	36	36	39	30	58	1.07	— 0.1	11	4,761	se.	31	se.	26	7	10	13	6.0	T.
Boise	2,739	61	68	27.16	30.02	+ .04	52.2	+ 1.3	81	12	64	30	7	40	36	46	42	73	1.32	+ 0.2	8	3,592	nw.	24	e.	26	11	9	10	5.2	T.
Lewiston	757	52	61	29.19	30.00	+ .01	55.8	+ 2.8	86	26	68	34	30	44	39				0.96	0.0	9	2,800	e.	28	w.	5	18	6	6	3.9	
Pocatello	4,482	46	54	25.45	29.97	+ .03	48.4	+ 1.6	80	13	60	26	1	37	36	39	30	53	0.98	— 0.5	7	5,923	e.	32	w.	6	10	14	6	4.6	4.1
Spokane	1,929	101	110	27.96	30.02	+ .03	50.4	+ 2.4	79	13	62	28	7	39	36	42	34	58	1.58	+ 0.2	8	4,759	ne.	36	s.	14	8	4	18	6.4	
Walla Walla	1,000	65	71	28.92	30.00	— .01	55.4	+ 2.1	81	12	66	33	1	44	31	51	47	77	2.11	+ 0.5	9	4,181	s.	34	sw.	19	16	12	2	3.7	
N. Pac. Coast Reg.							**51.3**	**+ 2.7**											**78**	**2.73**	**— 1.4**								**6.3**	
North Head	211	11	56	29.80	30.03	— .02	51.2	+ 3.2	88	11	56	38	7	46	37	48	46	87	2.01	— 3.5	13	11,865	se.	60	s.	21	10	10	10	5.8	
Port Crescent	259	12	29	29.73	30.01	— .01	46.9	+ 2.3	72	12	54	30	23	40	27				1.16	— 2.9	13	4,050	ne.	17	ne.	11	8	10	12	6.0	
Seattle	123	114	151	29.91	30.04	+ .01	52.6	+ 2.7	81	12	61	36	23	44	33	47	43	74	3.08	+ 0.3	13	4,540	se.	38	s.	5	6	18	6	5.6	
Tacoma	213	113	120	29.79	30.02	— .01	51.3	+ 2.4	82	12	60	33	23	42	35				3.84	+ 0.4	14	4,189	sw.	27	w.	14	8	11	11	6.0	
Tatoosh Island	86	7	57	29.90	30.09	.00	49.2	+ 3.1	74	11	54	38	4	44	26	46	44	86	4.10	— 3.3	17	11,673	e.	56	e.	11	5	9	16	7.0	
Portland, Oreg	154	68	96	29.85	30.01	— .05	54.8	+ 3.2	87	12	64	32	23	46	33	48	42	69	2.26	— 1.0	18	4,421	nw.	28	e.	1	7	5	18	6.7	T.
Roseburg	518	56	67	29.47	30.04	— .03	53.4	+ 2.2	93	11	63	34	6	44	47	47	42	72	2.69	+ 0.1	15	2,547	w.	36	sw.	21	7	4	19	7.2	
Mid. Pac. Coast Reg.							**56.0**	**+ 1.5**											**71**	**2.47**	**0.0**								**5.1**	
Eureka	62	62	80	30.01	30.08	— .03	52.5	+ 2.5	75	11	59	37	4	46	25	48	44	78	5.14	+ 0.9	17	4,936	se.	30	n.	6	7	8	15	6.1	
Mount Tamalpais	2,375	11	18	27.57	30.05	.00	49.7	.....	81	11	56	32	22	44	19	43	38	72	2.17	.....	10	12,675	sw.	58	sw.	12	10	9	11	5.4	T.
Red Bluff	332	50	56	29.66	30.02	— .01	58.3	— 1.0	89	9	68	38	20	48	36	50	44	66	2.88	+ 0.7	11	4,181	se.	24	n.	6	15	8	7	4.3	
Sacramento	69	106	117	29.96	30.03	+ .02	58.2	0.0	84	10	66	38	20	50	26	51	45	67	1.02	— 1.3	10	5,908	s.	35	sw.	19	14	9	7	4.3	
San Francisco	155	161	167	29.92	30.08	+ .03	56.8	+ 2.2	84	10	63	44	20	50	26	51	47	74	1.29	— 0.7	8	6,544	w.	32	nw.	30	12	8	10	4.6	
Point Reyes Light	490	7	50	.....	.....	.....	54.0	+ 3.6	82	10	59	42	19	49	24				2.01	+ 0.3	12	15,029	nw.	65	nw.	5	11	6	13	5.4	
Southeast Farallon	30	9	17	30.03	30.06	.....	53.6	.....	76	10	57	44	19	50	21	...	...	...	2.29	.....	13	10,890	nw.	45	nw.	5	11	7	12	5.5	
S. Pac. Coast Reg.							**59.4**	**+ 0.7**											**66**	**1.32**	**0.0**								**3.6**	
Fresno	330	67	70	29.67	30.03	+ .04	60.2	— 0.6	93	11	72	37	20	48	38	50	42	58	1.21	— 0.1	6	4,336	nw.	23	nw.	20	17	6	7	3.9	
Los Angeles	338	116	123	29.64	30.01	+ .02	61.0	+ 2.1	96	10	72	41	20	50	36	51	45	65	0.97	— 0.4	2	4,225	w.	30	sw.	23	13	13	4	3.7	
San Diego	87	94	102	29.90	30.00	+ .01	58.9	+ 0.6	78	10	66	44	21	52	25	53	49	74	0.15	— 0.6	3	4,665	nw.	23	w.	20	21	4	5	3.0	
San Luis Obispo	201	47	54	29.83	30.05	.00	57.4	+ 0.6	96	10	68	35	20	47	43	50	45	69	2.97	+ 1.0	7	4,652	w.	23	w.	29	14	10	6	4.0	
West Indies.																															
Basseterre	29	41	54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Bridgetown	30	57	65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Cienfuegos	52	62	67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Grand Turk	11	6	20	29.98	29.99	— .02	77.3	.....	87	30	83	63	21	71	22	.....	.....	.....	2.28	.....	9	.....	e.	.....	.....	.....	10	17	3	4.5	
Hamilton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Havana	57	87	105	29.93	30.00	+ .01	74.8	— 1.3	87	9	81	63	12	68	19	.....	.....	.....	0.56	— 2.3	7	8,264	e.	41	ne.	24	18	9	3	3.2	
Puerto Principe	352	55	62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
San Juan	82	48	90	29.89	29.97	— .01	76.0	— 1.3	86	19	82	67	4	71	15	71	68	76	3.97	+ 0.4	15	7,306	se.	28	se.	16	6	14	10	5.7	

* More than one date.

TABLE II.—*Climatological record of voluntary and other cooperating observers, April, 1904.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Anniston	85	33	60.3	2.93	
Ashville	83	30	57.2	1.88	
Bermuda	86	40	64.5	2.87	
Boligee	87	32	62.4	1.73	
Bridgeport	.....	.....	.....	2.15	
Burkeville	.....	.....	.....	2.20	
Calera	.....	.....	.....	1.63	
Camphill	85	33	61.3	0.43	
Citronelle	84	38	65.0	2.09	
Clanton	85	35	61.4	2.19	
Cordova	85[i]	29[i]	59.1[i]	3.51	
Daphne	82	42	66.5	1.35	
Decatur	80	33	56.8	2.78	
Demopolis	.....	.....	.....	1.78	
Dothan	85	41	65.2	2.00	
Eufaula	82	39	61.0	1.88	
Evergreen	83	39	64.1	1.82	
Flomaton	87[h]	39[h]	64.4[h]	1.56	
Florence *a*	.....	.....	.....	3.50	
Florence *b*	81	31	57.4	3.24	
Fort Deposit	86	37	62.4	1.22	
Gadsden	85	32	57.8	3.30	
Goodwater	84	33	59.0	1.46	
Greensboro	84	34	61.6	1.65	
Greenville	.....	.....	.....	2.25	
Hamilton	84[f]	33[f]	58.6[f]	3.16	
Highland Home	83	35	61.8	1.99	
Letohatchie	.....	.....	.....	1.44	
Livingston	84	28	60.0	2.12	
Lock No. 4	84	34	59.0	2.37	
Madison Station	83	30	57.3	2.99	
Maplegrove	83	31	55.0	2.34	
Marion	85	33	61.8	1.40	
Milstead	.....	.....	.....	1.24	
Newbern	89	31	61.6	1.63	
Notasulga	.....	.....	.....	0.60	
Oneonto	81	31	57.0	4.65	
Opelika	86	34	59.8	1.10	
Ozark	86	39	62.7	2.80	
Prattville	85	33	60.7	2.48	
Pushmataha	83	34	61.8	3.22	
Riverton	88	29	58.2	3.17	
Scottsboro	82	32	56.2	1.91	
Selma	86	36	62.8	2.83	
Spring Hill	81	43	65.2	.....	
Talladega	85	32	59.6	1.76	
Tallassee	.....	.....	.....	1.51	
Thomasville	89	34	62.2	2.60	
Tuscaloosa	85	31	59.4	1.67	
Tuscumbia	81	34	56.4	3.43	
Tuskegee	86	32	62.6	1.13	
Union Springs	85	35	62.0	1.55	
Uniontown	85	30	61.4	2.21	
Valleyhead	80	32	54.8	3.51	
Verbena	.....	.....	.....	2.44	
Wetumpka	86	35	62.9	2.44	
Alaska.					
Juneau	60	30	42.2	7.84	
Killisnoo	54	30	40.8	1.35	T.
Loring	62	26	41.0	1.95	5.0
Orca	58	30	38.8	13.55	7.0
Sitka	56	29	40.8	3.39	2.0
Skagway	58	27	41.0	2.31	.....
Teikhill	58[d]	10	39.9	0.72	7.2
Arizona.					
Agua Caliente	101	34	69.3	0.00	
Allaire Ranch	.....	.....	.....	0.00	
Arizona Canal Co's Dam	97	38	69.7	0.00	
Aztec	102	42	74.7	0.00	
Benson	88	34	60.8	0.00	
Bisbee	87[c]	36[c]	62.8[c]	0.00	
Blue	85	22	54.2	0.00	
Bowie	91	32	60.8	0.00	
Buckeye	95	46	70.5	0.00	
Casagrande	104	37	69.6	0.00	
Champie Camp	101	31	66.6	0.00	
Cochise[•1]	99	35	70.9	0.00	
Congress	89	39	66.6	T.	
Douglas	94	29	62.2	0.00	
Dragoon[•1]	81	45	61.7	0.00	
Dudleyville	96	30	64.0	0.00	
Duncan	91	.....	.....	0.00	
Fort Apache	85	22	53.8	0.10	1.0
Fort Defiance	79	17	44.6	0.05	0.5
Fort Grant	98	33	64.1	0.00	
Fort Huachuca	86	32	63.2	0.00	
Fort Mohave	104	42	71.1	0.00	
Gillabend	108	38	69.0	0.00	
Grand Canyon	75	10	43.4	0.00	
Greaterville	86	32	59.6	0.00	
Holbrook	86	12	53.0	0.00	
Jerome	84	35	60.8	T.	
Kingman	90	20	58.0	0.05	
Maricopa	98	35	67.8	0.00	
Mesa	99	35	67.3	0.00	
Mohawk Summit[•1]	107	56	77.5	0.00	
Natural Bridge	.....	.....	.....	0.00	
Oracle	85	38	62.4	0.00	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Oro	.....	.....	.....	0.00	
Parker	106	38	69.4	T.	
Phoenix	98	34	65.9	0.00	
Pinal Ranch	.....	.....	.....	0.04	0.2
Prescott	75	16	47.7	0.05	
St. Johns	85	19	52.6	0.10	1.0
San Carlos	96	31	63.7	T.	
San Simon	93	30	64.5	0.00	
Sentinel[•1]	102	56	77.4	0.00	
Signal[b]	103	33	67.2	0.06	
Superstition	.....	.....	.....	T.	
Taylor	85	21	51.3	0.00	
Thatcher	94	29	62.2	0.00	
Tonto	97	40	66.3	0.00	
Tuba	83	21	53.6	0.00	
Tucson	92	33	63.9	0.00	
Vail[•5]	96	55	71.9	0.00	
Walnutgrove	.....	.....	.....	0.00	
Wilcox	88	26	59.6	0.00	
Williams	80	14	48.0	0.16	
Yarnell	.....	.....	.....	0.03	
Young	87	20	53.2	0.00	
Arkansas.					
Alco	81	28	54.7	2.94	
Amity	85	30	59.2	7.94	
Arkadelphia	82	36	59.0	3.69	
Arkansas City	.....	.....	.....	3.36	
Batesville	82	32	56.0	1.64	
Blanchard	85	33	61.6	4.80	
Brinkley	79	35	55.2	2.77	
Camden *a*	.....	.....	.....	3.72	
Camden *b*	82	42	57.9	3.42	
Conway	84	29	58.1	3.26	
Corning	81	32	52.5	5.52	T.
Dallas	84	35	59.6	3.69	
Dardanelle	.....	.....	.....	1.64	
Des Arc	81	30	58.0	3.47	
Dodd City	86	25	51.8	3.25	T.
Dutton	77	27	52.0	5.16	T.
Elon	85[i]	33[c]	60.8[i]	6.19	
Eureka Springs	77	30	53.4	4.23	T.
Fayetteville	78	31	53.4	3.36	T.
Forrest City[j]	80	35	56.7	.....	
Fulton	.....	.....	.....	6.32	
Hardy	82	32	54.2	5.11	
Heber	85	27	56.2	1.93	
Helena *a*	.....	.....	.....	3.96	
Helena *b*	80	32	58.0	3.39	
Hope	86	38	62.2	5.36	
Howe	87	35	61.2	5.51	
Jonesboro	89	33	59.5	4.68	
Lacrosse	83	29	52.8	.....	
Lake Village	88	34	59.4	3.08	
Lonoke	84	30	57.5	3.14	
Lutherville	82	31	54.6	2.42	
Malvern	82	31	57.2	5.70	
Marvell	81	33	58.6	3.47	
Mossville	72	29	51.7	5.21	T.
Mount Nebo	78	33	54.5	2.96	
New Gascony	85[f]	41[f]	62.9[f]	3.70	
New Lewisville	85	34	60.1	5.06	
Newport *a*	.....	.....	.....	2.28	
Newport *b*	84	33	56.0	2.47	
Oregon	87	25	52.6	2.43	T.
Osceola	80	38	56.8	3.27	
Ozark	89	38	58.4	4.13	
Paragould	82	32	55.6	4.94	
Perry	87	33	58.8	2.11	
Pinebluff	84	32	57.8	4.96	
Pocahontas	82	30	54.3	5.97	
Pond	78	24	53.2	3.16	T.
Prescott	83[c]	35[c]	58.8[c]	5.16	
Princeton	88	30	59.4	4.70	
Rison	84	29	56.4	3.82	
Russellville	82	31	55.5	3.71	
Silversprings	78	32	53.6	2.97	T.
Spielerville	82	38	58.0	2.89	
Stuttgart	81	30	57.8	2.82	
Texarkana	86	34	62.0	2.90	
Warren	85	35	59.8	4.22	
Wiggs	78	31	55.8	6.96	
Witts Springs	73[c]	29[c]	51.5[c]	3.73	
California.					
Alturas	.....	18	.....	4.53	24.0
Angiola	98	39	62.6	0.75	
Azusa	100	34	61.0	1.45	
Bagdad	96	43	69.2	0.00	
Bakersfield	98	33	60.8	0.63	
Barstow	96	34	66.4	0.00	
Bear Valley	.....	.....	.....	6.87	44.0
Berkeley	83	37	55.4	2.10	
Bishop	87	23	52.8	0.04	
Bodie	67	— 4	34.4	1.00	9.0
Bowman	.....	.....	.....	8.52	60.5
Branscomb	87	26	48.6	7.04	2.0
Brush Creek	87	30	52.0	6.31	T.
Butte Valley	.....	.....	.....	6.65	29.0
Caliente[•1]	90	38	56.0	1.40	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Campbell	88	35	55.2	1.83	
Campo	.....	.....	.....	0.49	
Cedarville	85	22	45.1	1.27	9.0
Chico	94	33	58.9	2.14	
Chino	93	42	63.0	0.99	
Cisco[•1]	50	20	34.4	5.20	48.0
Claremont	96	35	59.6	1.20	
Cloverdale	92	33	56.9	3.22	
Colusa	83	37	57.6	1.63	
Corning[•5]	85	48	57.8	1.90	
Coronado	.....	.....	.....	0.16	
Crescent City	80	36	51.5	6.89	
Cuyamaca	71	25	45.0	2.64	T.
Delano[•1]	93	46	62.0	0.53	
Delta	95	32	54.2	8.36	
Dobbins	91	38	60.3	2.68	2.0
Drytown	86	37	57.0	3.30	
Dunnigan[•1]	83	45	61.6	1.10	
Durham	89	34	56.7	2.43	
Elcajon	95	38	60.6	0.10	
Electra	.....	.....	.....	3.39	
Elmdale	90	31	58.2	1.35	
Elsinore	104	30	60.4	0.28	
Escondido	90	28	54.6	0.47	
Folsom	.....	.....	.....	2.05	
Fordyce	.....	.....	.....	6.67	69.0
Fort Bragg	.....	.....	.....	4.10	
Fort Ross	75	36	53.2	5.23	
Foster	.....	.....	.....	0.64	
Fouts Springs	.....	.....	.....	2.24	
Georgetown	79	30	51.4	5.52	1.0
Gilroy (near)	94	34	56.7	1.72	
Greenville	83	24	46.4	2.43	5.0
Hanford	94	20	58.8	0.72	
Healdsburg	92	33	57.0	3.35	
Hollister	90	34	56.0	1.50	
Imperial	104	43	70.6	0.05	
Indio	110	43	78.0	0.00	
Iowa Hill[•1]	82	36	52.0	5.33	4.0
Irvine	.....	.....	.....	0.95	
Isabella	92	38	59.0	0.95	
Jamestown	87	30	54.3	3.58	
Kennedy Gold Mine	.....	.....	.....	3.01	
Kentfield	.....	.....	.....	2.44	
Kernville	.....	.....	.....	0.43	
King City	97	33	57.6	1.02	
Lakeport (near)	78	38	54.0	2.17	
Lamesa	.....	.....	.....	0.32	
Laporte	76	20	41.2	7.63	49.0
Legrande	95	32	54.0	0.90	
Lemoncove	96	36	61.8	1.96	
Lick Observatory	77	24	45.6	4.21	8.0
Livermore	92	34	56.4	1.56	
Lodi	84	34	56.8	1.44	
Los Gatos	88	38	56.7	3.66	
Lowe Observatory	.....	.....	.....	2.10	
Magnolia	86	30	55.2	5.67	1.0
Mammoth	104	38	78.8	0.00	
Marysville	88	38	58.8	1.30	
Merced	90	34	59.0	1.32	
Mercury	.....	.....	.....	3.19	
Mills College	.....	.....	.....	1.79	
Milo	.....	.....	.....	1.90	
Milton (near)	83	37	57.8	1.74	
Modesto[•1]	87	41	64.7	1.76	
Mohave	90	32	61.0	0.00	
Mokelumne Hill	.....	.....	.....	3.51	
Montague	88	23	48.5	3.00	
Monterio	82	28	54.0	1.60	
Monterey[•1]	86	38	54.5	2.27	
Mount St. Helena	.....	.....	.....	5.19	1.5
Napa	88	34	54.8	1.70	
Needles	99	45	75.1	0.00	
Nellie	.....	.....	.....	2.50	0.5
Nevada City	86	29	49.5	6.19	12.0
Newcastle	88	37	58.3	2.88	
Newman	95	37	59.4	1.51	
Niles	88	38	57.5	2.11	
Nordhoff	.....	.....	.....	2.96	
North Bloomfield	86	27	49.7	5.59	
Oakland	82	42	58.2	1.18	
Ontario (near)	98	36	61.6	1.21	
Orland	91	35	59.9	1.87	
Orleans	96	36	59.0	3.59	
Oroville (near)	88	36	58.4	1.94	
Palermo	86	34	57.4	1.68	
Peachland[•5]	86	38	56.4	2.71	
Pilot Creek	.....	.....	.....	7.24	24.5
Pine Crest	94	38	60.4	3.44	
Pino Grande	80	25	45.4	9.25	49.5
Placerville	81	30	51.6	4.60	
Point Lobos	78	41	55.3	0.70	
Porterville	96	32	60.5	1.12	
Poway	.....	.....	.....	0.41	
Quincy	80	27	47.3	1.97	1.0
Redding	90	36	57.4	6.56	
Redlands	88	35	61.9	0.82	
Reedley	92	30	62.4	1.24	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Represa	74	40	56.7	2.13	
Riovista	83	38	57.8	1.62	
Riverside	98	33	59.4	0.58	
Rohnerville	.....	.....	.....	5.83	
Rosewood	89	33	55.2	4.35	
Sacramento	84	38	59.0	1.35	
Salinas	93	36	57.3	1.73	
Salton	105	40	71.8	0.00	
San Bernardino	97	31	59.4	0.80	
San Jacinto	.....	.....	.....	0.34	
San Jose	92	37	58.7	1.74	
San Leandro	87	37	56.8	2.28	
San Mateo*1	90	44	61.0	1.10	
San Miguel*1	90	38	57.7	0.87	
San Miguel Island	.....	.....	.....	1.33	
San Rafael	87	37	56.6	1.05	
Santa Barbara	88	39	58.4	1.89	
Santa Clara College	91	34	56.6	1.75	
Santa Cruz	92	33	55.0	3.14	
Santa Maria	95	38	60.0	1.73	
Santa Monica	85	41	58.4	1.51	
Santa Rosa	86	32	54.0	2.99	
Sausalito	.....	.....	.....	2.65	
Shasta	97	35	59.0	7.84	
Sierra Madre	89	40	59.7	1.28	
Sisson	90	22	46.8	4.89	10.0
Snedden	.....	.....	.....	0.90	
Sonoma	.....	.....	.....	1.62	
Sonora	83	36	57.6	3.91	T.
Stirling City	85	24	47.8	7.01	15.5
Stockton	84	36	55.6	1.81	
Storey	88	31	57.9	0.90	
Summerdale	77	15	44.3	5.37	17.0
Summit	48	24	34.0	3.90	39.0
Susanville	78	23	46.0	0.86	1.0
Tehama*1	83	44	58.9	2.19	
Tejon Ranch	92	40	60.4	1.13	
Truckee*1	68	24	41.0	0.90	9.0
Tulare c	96	34	60.0	0.96	
Tustin	.....	.....	.....	0.82	
Ukiah	92	30	54.4	3.10	
Upland	90	34	57.6	1.77	
Upperlake	92	28	52.6	2.77	T.
Upper Mattole	.....	.....	.....	8.13	
Vacaville*1	86	43	58.1	1.49	
Visalia	92	32	59.6	0.85	
Volcano	105	38	71.0	0.00	
Wasco	97	34	60.3	0.75	
Wheatland	83	36	57.4	0.99	
Willits	96	29	56.3	4.43	T.
Willow	84	36	56.8	1.59	
Yosemite	.....	.....	.....	4.88	17.5
Zenia	83	22	47.2	7.40	8.0
Colorado.					
Alford	74	14	42.7	0.82	4.8
Antelope Springs	65	5	37.2	0.22	2.8
Ashcroft	64	5	35.1	1.67	10.0
Blaine	84	19	49.1	0.41	
Boulder	77	22	49.4	1.45	1.0
Breckenridge	63	7	34.3	1.39	17.5
Buenavista	.....	.....	.....	1.35	16.0
Burlington	79	11	47.6	3.15	
Canyon	82	19	51.6	0.29	3.0
Castlerock	77	14	45.4	0.73	
Cheesman	75	16	46.0	0.92	3.2
Cheyenne Wells	79	19	48.4	1.59	
Clearview	62	11	35.7	1.93	21.5
Collbran	80	20	48.6	0.99	5.5
Colorado Springs	73	17	45.6	0.08	0.3
Columbine Mine	53	6	29.8	1.10	20.0
Conejos	72	10	44.0	0.00	
Cripplecreek	.....	.....	.....	0.18	
Delta	90f	19	52.8e	T.	T.
Durango	77	20	48.4	0.56	
Fort Collins	80	14	46.2	0.89	
Fort Morgan	80	18	47.8	1.65	3.5
Fowler	.....	.....	.....	0.93	T.
Fox	81	12	47.7	2.45	
Fruita	83	24	53.0	0.27	
Garnett	74	10	42.2	0.15	
Gilman	.....	.....	.....	0.82	9.0
Gleneyre	78	14	46.2	0.39	2.0
Glenwood	79	19	46.4	0.50	
Greeley	82	19	49.2	1.70	.....
Grover	.....	.....	.....	0.70	
Gunnison	72	14	40.6	0.08	2.2
Halls Gulch	62	1	26.4	0.96	14.9
Hamps	78	14	45.4	0.71	5.8
Hoehne	82	10	47.5	1.50	.....
Holly	84	10	51.3	0.90	
Holyoke (near)	.....	.....	.....	2.63	.....
Husted	75	13	43.7	0.70	4.0
Lake Moraine	56	6	33.4	2.30	33.2
Lamar	88	22	55.0	0.94	
Laporte	.....	.....	.....	0.44	0.8
Las Animas	84	18	51.3	0.60	
Lay	74	13	42.4	0.59	6.0
Leadville (near)	58	7	32.9	0.79	6.5
Leroy	79	18	45.6	1.99	5.5
Longs Peak	61	1	34.6	0.87	5.0
Mancos	76	17	46.2	0.44	
Marshall Pass	55	16	32.8	0.17	1.0
Meeker	75	17	44.2	0.75	.....
Montrose	77	21	49.6	0.03	
Moraine	67	11	39.2	0.40	3.0
Pagoda	74	11	43.8	0.82	8.0
Parachute	81	26	51.3	1.04	3.0
Platte Canon	.....	.....	.....	1.25	0.8
Rockyford	88	20	51.1	0.81	
Ruby	.....	.....	.....	2.86	36.8
Saguache	72	9	44.0	T.	T.
Salida	73	17	44.8	1.69	13.5
San Luis	77	9	43.0	0.50	6.0
Santa Clara	76	11	43.6	2.24	9.5
Silt	78	21	48.9	0.87	2.5
Sugar City	.....	.....	.....	0.78	
Sugar Loaf	.....	.....	.....	1.00	8.0
Trinidad	81	20	52.4	1.17	
Victor	61	10	38.2	0.29	3.5
Vilas	.....	.....	.....	0.50	
Wagon Wheel	66	11	37.2	.....	
Wallet	.....	.....	.....	3.35	
Waterdale	82	16	48.3	0.68	
Westcliffe	68	1	40.3	0.95	12.0
Whitepine	58	−3	32.6	1.04	14.0
Wray	84	25	49.4	2.46	T.
Yuma	.....	.....	.....	3.37	2.0
Connecticut.					
Bridgeport	72	24	45.6	5.83	T.
Canton	74	18	42.4	5.08	3.0
Colchester	75	20	44.2	8.52	0.5
Falls Village	.....	.....	.....	2.14	5.0
Hartford	74	24	44.2	5.88	1.5
Hawleyville	74	20	44.2	4.60	1.0
Lake Konomoc	.....	.....	.....	8.75	
New London	68	25	44.2	4.87	T.
North Grosvenor Dale	74	20	44.1	7.62	.....
Norwalk	76	21	44.6	4.22	0.3
Southington	75	21	44.8	5.20	0.5
South Manchester	.....	.....	.....	5.88	0.5
Storrs	72	21	43.0	6.40	1.5
Voluntown	71	20	44.4	6.92	1.2
Waterbury	77	21	45.0	4.50	T.
West Cornwall	72	16	40.6	3.12	8.4
West Simsbury	.....	.....	.....	4.35	4.0
Delaware.					
Delaware City	.....	.....	.....	2.28	T.
Milford	84	26	51.2	2.51	T.
Millsboro	83	26	50.4	3.30	
Newark	79	24	48.1	1.94	
Seaford	77	26	48.4	1.95	
District of Columbia.					
Distributing Reservoir*b	79	30	50.0	3.14	.....
Receiving Reservoir*b	67	29	51.0	3.40	.....
West Washington	82	27	50.4	4.07	T.
Florida.					
Apalachicola	83	47	67.1	2.51	
Archer	88	44	67.2	1.14	
Avon Park	91	48	71.8	2.42	
Bartow	90	47	71.2	2.39	
Bonifay	85	43	65.6	2.98	
Brooksville	92	47	69.0	1.30	
Carrabelle	89	44	67.5	1.90	
Clermont	92	50	71.8	0.97	
De Funiak Springs	85	40	64.6	2.25	
Deland	88	45	68.0	.....	
Eustis	92	49	71.4	3.88	
Federal Point	87	48	66.4	1.77	
Fernandino	87	49	66.4	0.84	
Flamingo	88	50	73.3	1.08	
Fort Meade	93	47	70.5	2.98	
Gainesville	88	44	67.4	1.83	
Grasmere	87	49	70.0	.....	
Huntington	88	43	67.0	0.80	
Hypoluxo	88	55	72.2	1.30	
Inverness d	91	45	69.0	1.35	
Jasper	89	41	65.8	0.62	
Johnstown	89	41	65.3	2.56	
Kissimmee	88	48	69.6	2.25	
Lake City	89	41	66.0	0.97	
Macclenny	92	38	65.8	1.08	
Madison	88	46	66.5	1.75	
Malabar	89	49	71.4	0.82	
Manatee	90	47	70.1	0.37	
Marco	89	.....	.....	0.36	
Marianna	88	38	64.6	2.26	
Merritt Island	85	57	71.7	2.88	
Miami	90	.....	.....	2.04	
Micanopy	90c	44c	68.8c	2.00	
Middleburg	89	38	65.1	2.68	
Molino	90	39	65.6	1.69	
Monticello	87	44	64.9	1.90	
Myers	88	50	71.3	1.10	
New Smyrna	90	45	68.4	1.10	
Nocatee	92	48	71.8	0.60	
Ocala	95	45	69.0	1.20	
Orange City	94	42	70.2	2.01	
Orange Home	90e	42e	69.0e	1.44	
Orlando	92	49	71.0	2.20	
Pinemount	89	40	66.0	0.91	
Plant City	.....	.....	.....	1.55	
Rockwell	94	46	69.7	1.15	
St. Andrews	84	40	64.6	3.13	
St. Augustine	88	43	66.8	1.40	
St. Leo	91	47	69.6	1.50	
Stephensville	88	39	65.4	1.26	
Sumner	88	40	65.6	2.45	
Switzerland	87	44j	66.6e	1.46	
Tallahassee	83	45	66.8	1.65	
Tarpon Springs	89	49	69.2	1.14	
Titusville	91	47	70.2	1.81	
Wausau	87	40	65.7	2.00	
Wewahitchka	87	44	65.7	2.48	
Georgia.					
Abbeville	.....	.....	.....	1.28	
Adairsville	80b	31c	56.6c	2.80	
Albany	87c	38g	62.9e	1.45	
Americus	84	38	60.8	1.97	
Athens	82	34	56.0	1.69	
Bainbridge	88c	40	66.8	2.49	
Blakely	91	40	65.4	1.43	
Bowersville	82	31	56.7	1.91	
Butler	.....	.....	.....	1.47	
Camak	86	30	59.6	0.45	
Canton	.....	.....	.....	2.61	
Carlton	.....	.....	.....	2.48	
Clayton	78	23	52.8	2.85	
Columbus	85d	38d	62.8d	0.99	
Cordele	86	39	61.6	1.64	
Covington	86	33	58.2	2.30	
Dahlonega	77	29	53.4	2.55	
Dawson	87	36	63.1	1.73	
Diamond	82c	24	54.9	3.18	T.
Douglas	89	41	65.3	1.62	
Dublin	.....	.....	.....	0.89	
Dudley	86	34	61.6	1.08	
Eastman	.....	.....	.....	1.26	
Eatonton	84	35	59.4	1.19	
Elberton	82	33	58.0	2.55	
Experiment	81	33	57.6	2.07	
Fleming	90	35	63.0	1.16	
Fort Gaines	86	39	62.6	2.02	
Gainesville	78	32	54.0	1.49	
Gillsville	84	30	56.5	1.77	
Greenbush	86	29	56.8	1.94	
Greensboro	85	30	57.6	1.16	
Griffin	84	33	58.5	1.88	
Harrison	85	32	60.8	1.05	
Hawkinsville	87	34	61.0	0.69	
Jesup	90	37	64.2	1.05	
Lost Mountain	83	27	56.2	1.41	
Louisville	84	34	60.2	0.88	
Lumpkin	88	37	63.4	1.38	
Marshallville	84	38	59.3	1.68	
Mauzy	93	40	65.9	1.80	
Milledgeville	87	34	60.0	1.09	
Millen	86	34	61.3	1.25	
Monticello	86	33	59.0	1.47	
Morgan	85	40	62.0	1.74	
Newnan	84	30	57.5	1.37	
Oakdale	.....	.....	.....	1.76	
Point Peter	82	27	56.2	2.88	
Poulan	87	37	62.4	1.86	
Putnam	86	35	61.3	1.63	
Quitman	87	41	65.4	1.33	
Ramsey	77	27	55.6	2.87	
Resaca	.....	.....	.....	2.27	
Rome	85	30	56.7	3.18	
St. Marys	92	41	65.4	0.60	
Talbotton	84	32	59.7	1.88	
Tallapoosa	85	28	56.4	1.35	
Thomasville	88	41	65.2	1.81	
Toccoa	82	30	56.3	2.02	
Valona	87	39	63.2	0.52	
Washington	85	36	57.6	1.23	
Waverly	91	38	64.6	0.96	
Waycross	90	42	65.9	2.17	
Waynesboro	86	35	60.8	0.75	
Westpoint	86	34	60.6	1.92	
Woodbury	81c	30g	56.8c	1.19	
Idaho.					
Albion	80	22	46.2	0.25	0.4
American Falls	83	25	47.4	0.75	
Blackfoot	80	18	46.2	T.	T.
Blue Lakes	91	27	53.5	0.62	
Cambridge	83	27	50.8	1.09	
Chesterfield	73	19	42.4	1.36	T.
Forney	77	7	43.8	1.57	2.0
Garnet	97	27	56.6	0.98	
Grangeville	79	28	47.6	2.40	4.2
Hailey	70	13	39.9	1.94	4.2
Idaho City	79	17	44.8	0.93	
Lake	60	0	34.8	1.00	10.0
Lost River	74	13	42.8	1.02	1.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Malad City	79	23	47.8	2.07	3.0
Meadows	75	13	41.8	1.44	
Moscow	79	28	49.2	1.21	
Murray	77	19	45.2	0.45	T.
Oakley	83	21	48.2	0.96	5.0
Ola	81	26	49.8	1.29	
Orofino	85	27	51.0	1.60	
Paris[e]	68	0	31.8	.....	
Payette	84	28	52.8	1.54	
Pollock	83	29	52.0	1.74	
Porthill	73	24	47.2	1.08	
Priest River[e]	77	20	44.0	1.44	
Riddle	70	19	40.0	1.57	7.0
Roosevelt	47	— 8	22.8	4.93	44.5
St. Maries	85	26	49.0	2.03	
Soldier	62	0	33.3	0.79	3.5
Vernon	74	10	40.6	1.33	.....
Weston	80	21	47.2	1.27	2.0
Illinois.					
Albion	83	27	50.2	2.82	2.0
Aledo	81	23	45.8	1.95	0.5
Alexander	83	24	47.5	5.26	T.
Antioch	82	18	40.3	2.20	
Ashton	80	20	42.8	3.10	2.5
Astoria	82	23	46.2	4.35	3.0
Aurora	81	20	42.4	4.21	T.
Beardstown	.....	.....	.....	4.95	.....
Benton	80	24	52.2	4.01	4.0
Bloomington	86	23	47.1	4.45	T.
Bushnell	87	26	48.6	3.04	
Cambridge	82	23	44.4	1.84	3.5
Carlinville	80	24	48.2	6.88	1.0
Carrollton	79	27	48.8	7.34	4.0
Charleston	81	24	48.2	4.54	
Chester	.....	.....	.....	5.47	14.4
Cisne	82	26	50.4	2.86	3.0
Coatsburg	83	26	46.4	6.44	2.5
Cobden	80	30	52.2	4.28	2.0
Danville	82	22	48.1	3.05	T.
Decatur	82	24	47.4	3.39	T.
Dixon	83	13	42.8	2.29	1.0
Effingham	80	26	48.7	1.20	T.
Equality	82	24	50.6	4.09	4.0
Fandon	81	26	46.6	4.45	5.2
Flora	80	28[e]	49.0	2.45	0.4
Friendgrove	80	29	50.1	2.97	T.
Galva	84	22	44.2	2.60	3.8
Grafton	.....	.....	.....	5.16	6.4
Greenville	80	27	49.6	4.19	4.5
Griggsville	80	21	48.6	5.92	.....
Halfway	78	28	50.9	4.50	3.0
Havana	83	23	47.4	4.03	T.
Henry	83	21	46.0	3.51	T.
Hillsboro	81	24	47.0	5.05	2.0
Hoopeston	.....	.....	.....	2.61	1.0
Joliet	80	23	43.4	3.81	0.8
Kishwaukee	82	18	43.5	2.84	0.5
Knoxville	81	20	43.9	2.32	4.0
Lagrange	81	21	42.4	2.02	T.
Laharpe	82	25	46.2	2.85	T.
Lanark	84	16	43.6	3.08	5.0
La Salle	84	20	45.4	2.86	
Loami	.....	.....	.....	4.46	
McLeansboro	79	22	49.1	3.93	7.0
Martinsville	82[d]	23[d]	48.4[d]	0.95	
Martinton	80	22	45.6	3.26	T.
Mascoutah	78	21	47.4	4.11	6.0
Mattoon	80	28	50.9	2.77	T.
Minonk	82	23	44.4	2.75	1.5
Monmouth	83	23	45.4	2.51	8.0
Morrison	79	21	44.3	3.18	4.5
Morrisonville	80	27	47.8	5.10	T.
Mount Carmel	.....	.....	.....	2.64	1.4
Mount Pulaski	83	26	46.9	5.61	T.
Mount Vernon	81	27	49.0	3.79	6.0
New Burnside	80	24	51.2	5.06	2.5
Olney	81	27	49.5	2.20	
Ottawa	84	23	46.0	3.93	T.
Palestine	81	26	50.2	1.95	T.
Pana	82	27	47.6	4.48	
Paris	80	25	47.4	2.97	T.
Peoria *a*	.....	.....	.....	3.71	.....
Peoria *b*	83	25	48.4	3.48	.....
Philo	80	23	46.0	4.06	
Plumhill	79	21	49.3	4.49	5.0
Pontiac	81	24	45.1	3.63	T.
Rantoul	83	22	45.2	4.62	T.
Raum	80	28	51.0	4.01	2.0
Riley	81	19	41.7	2.27	0.6
Robinson	80	25	48.5	2.61	
Rockford	.....	.....	.....	2.20	T.
Rushville	82	26	47.1	6.60	T.
St. Charles	83	20	42.6	2.92	T.
St. John	80	22	51.2	3.43	6.0
Shobonier	80	27	49.4	4.43	4.0
Streator	84	22	44.2	3.91	T.
Sullivan	82	23	47.2	4.56	T.
Sycamore	86	20	42.2	2.91	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Tilden	78	29	50.0	4.62	8.0
Tiskilwa	81	21	43.6	3.32	0.1
Tuscola	81	21	46.2	4.73	T.
Urbana	80	22	45.2	3.97	T.
Walnut	83	23	45.8	1.69	0.4
Winchester	82	25	47.4	5.57	T.
Windsor	81	23	47.4	3.42	T.
Winnebago	81	19	42.9	3.41	2.5
Yorkville	83	20	42.7	5.23	T.
Zion	80	19	42.8	3.12	4.0
Indiana.					
Anderson	77	22	46.0	5.64	0.5
Angola	75	18	43.0	2.71	0.8
Auburn	77[c]	20[c]	43.3[c]	2.86	.....
Bloomington	.....	.....	.....	2.80	T.
Bluffton	78	20	45.1	3.30	1.0
Butlerville	79	25	48.2	2.97	T.
Cambridge City	77	21	44.6	4.33	0.1
Columbus	81	24	48.0	1.49	T.
Connersville	81	22	46.8	2.97	T.
Crawfordsville	79	21	45.6	3.42	
Delphi	81	22	45.0	5.22	0.5
Elkhart	78	22	43.2	2.02	
Farmersburg	79	25	48.5	2.42	
Farmland	77	22	44.4	5.36	
Fort Wayne	80	20	45.0	4.32	T.
Franklin[e1]	87	31	49.3	1.66	
Greencastle	77	24	46.3	5.87	0.4
Greenfield	73	24	45.9	2.14	
Greensburg	80	22	47.5	2.65	T.
Hammond	80	25	42.4	3.64	
Hector	76	20	44.6	5.55	T.
Holland	83	21	51.6	3.36	T.
Huntington	77	20	43.6	4.45	T.
Jeffersonville	80	29	50.8	3.11	T.
Kokomo	80	23	45.6	3.46	0.2
Lafayette	79	23	45.4	3.82	0.8
Laporte	79	22	43.2	1.37	T.
Logansport	81	21	45.0	3.99	0.8
Madison *a*	83	25	50.6	2.62	0.8
Madison *b*	.....	.....	.....	4.13	.....
Marengo	82	24	49.4	2.80	
Marion	80	21	45.1	4.30	0.5
Markle	77	18	44.5	5.30	T.
Mauzy	78	21	45.3	3.39	1.2
Moores Hill	79	24	47.5	2.44	T.
Mount Vernon	73	23	49.6	4.61	8.8
Northfield	78	19	44.5	2.77	T.
Paoli	82	24	49.8	2.45	T.
Princeton	80	28	50.0	2.86	1.0
Rensselaer	77	23	44.8	4.25	0.5
Richmond	79	20	46.0	2.14	.....
Rochester	78	22	44.8	3.65	T.
Rockville	80	22	47.2	3.95	T.
Rome	87[e]	24	49.8[e]	1.93	T.
Salem	82	24	50.8	2.33	1.0
Scottsburg	81	28	51.3	2.29	1.0
Seymour	79	27	50.2	2.10	T.
Shelbyville	79	26	47.7	2.18	
South Bend	78	18	41.3	2.92	0.5
Syracuse	78	19	43.6	3.76	T.
Terre Haute	78	28	51.4	5.60	
Topeka	76	20	44.2	1.58	
Valparaiso	79	23	44.2	4.67	
Veedersburg	80[e]	25[e]	48.6[e]	2.46	
Vevay	78	27	49.7	1.55	0.5
Vincennes	83	28	50.2	1.96	
Washington	80	26	48.0	3.11	T.
Winamac	78	22	44.4	4.68	T.
Worthington	82	25	50.4	2.00	T.
Indian Territory.					
Ardmore	90	32	61.0	2.19	
Chickasha	95	29	61.6	1.44	
Claremore	85	32	59.1	2.68	
Coalgate	91	33	59.4	2.40	
Durant	88	36	61.0	2.76	
Fairland	80	32	54.4	3.64	T.
Goodwater	87	32	59.9	3.56	
Hartshorne	82	33	58.8	3.68	
Healdton	91	31	63.1	4.09	
Holdenville	86	34	58.8	2.56	
Marlow	93	36	60.1	1.79	
Muskogee	81	34	56.3	2.03	
Okmulgee	82	31	57.7	1.27	
Pauls Valley	87	28	57.3	2.45	
Ravia	88	35	61.8	2.22	
Roff	87	38[d]	63.7[b]	4.63	
South McAlester	.....	.....	.....	3.15	
Tahlequah	79	30	57.8	2.40	
Tulsa	.....	.....	.....	1.84	
Vinita	80	30	56.0	2.99	
Wagoner	82	32	57.2	3.47	
Webbers Falls	94	29	57.8	3.58	
Iowa.					
Afton	75	23	45.4	5.61	5.5
Albia	81	22	43.3	5.26	
Algona	77	18	42.9	2.14	T.
Allerton	77	24	45.6	4.74	6.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Alta	75	20	41.6	4.44	T.
Amana	79	23	45.0	4.22	0.1
Ames	77	22	45.0	4.19	T.
Atlantic	77	20	44.4	4.35	1.8
Audubon	76	21	43.7	3.44	1.5
Baxter	78	20	44.4	5.03	
Bedford	76	21	45.0	5.62	0.8
Belknap	80	27	45.6	4.51	
Belleplaine	78	21	42.9	3.14	1.6
Bonaparte	83	24	46.0	3.36	1.5
Britt	73	21	42.2	3.05	2.0
Buckingham	.....	.....	.....	3.28	T.
Burlington	83	26	47.2	3.28	
Carroll	78	19	43.0	3.43	1.0
Cedar Rapids	80	23	44.5	1.85	
Chariton	78	23	45.0	4.66	1.0
Charles City	75	20	42.0	1.95	2.0
Clarinda	75	25	44.8	4.89	1.0
Clearlake	76	18	43.4	2.15	2.0
Clinton	83	21	44.8	3.40	T.
College Springs	77[c]	22[d]	46.8[d]	4.74	1.0
Columbus Junction	82	23	45.2	2.91	0.2
Corning	75	25	44.2	5.15	2.0
Corydon	78	18	45.8	4.68	2.0
Cresco	73	18	40.6	2.95	.....
Cumberland	.....	.....	.....	4.10	4.0
Decorah	77	21	43.4	2.16	0.5
Delaware	79	19	42.4	1.93	1.0
Denison	74	17	42.6	2.20	1.0
Desoto	77	22	45.4	5.56	T.
Dows	74	18	42.6	2.30	0.5
Earlham	73	18	41.4	7.64	2.0
Elkader	79	19	43.8	1.52	1.0
Estherville	76	20	40.9	3.34	T.
Fayette	76	18	41.6	2.33	1.5
Florence	80[c]	18[b]	43.4[c]	2.51	0.3
Forest City	86	21	42.4	2.35	1.0
Fort Dodge	76	21	42.4	4.66	T.
Fort Madison	.....	.....	.....	4.29	1.7
Galva	75	15	41.4	3.63	1.5
Gilman	.....	.....	.....	3.93	
Glenwood	76	22	46.5	3.50	T.
Grand Meadow	73	19	42.2	2.78	0.8
Greenfield	75	21	44.6	5.28	4.6
Grinnell	73	21	44.6	5.93	T.
Grundy Center	75	18	43.8	2.28	
Guthrie Center	81	20	47.3	3.72	.....
Hampton	80	21	44.2	2.59	0.8
Hanlontown	72	21	41.6	4.48	2.8
Harlan	74	20	43.6	3.20	1.0
Hopeville	75	23	45.0	3.90	.....
Humboldt	76	18	43.7	3.45	
Ida Grove	74	19	43.2	4.35	T.
Independence	75	19	42.7	2.15	2.0
Indianola	74	21	45.4	7.98	0.5
Inwood	75[c]	22	42.3	2.40	3.5
Iowa City	82	23	44.3	5.49	T.
Iowa Falls	74	22	42.6	2.40	1.3
Jefferson	.....	.....	.....	3.45	0.5
Keosauqua	83	22	45.4	3.86	.....
Knoxville	76	23	46.2	5.54	
Lacona	.....	.....	.....	4.12	
Larrabee	79	17	42.6	3.12	0.2
Leclaire	.....	.....	.....	2.43	T.
Lemars	76	17	42.7	3.50	2.0
Lenox	78	22	44.8	4.94	3.0
Leon	78	24	45.6	5.01	6.5
Logan	78	22	46.0	2.95	
Maple Valley	.....	.....	.....	4.06	
Maquoketa	80	20	43.3	2.99	
Marshalltown	77	20	43.7	3.60	
Mason City	75	23	43.2	2.32	1.0
Mountayr	78	23	46.2	4.52	5.0
Mount Pleasant	76	23	46.0	4.14	T.
Mount Vernon	84	19	46.6	2.97	0.5
New Hampton	74	18	41.5	1.90	0.5
Newton	76	21	44.2	4.87	
Northwood	77	22	43.4	2.15	4.6
Odebolt	79	18	43.5	3.71	
Olin	79	22	44.0	2.16	.....
Onawa	81	19	45.8	1.82	.....
Osage	76	21	42.3	1.87	2.9
Osceola	80	20	45.4	4.11	3.5
Oskaloosa	75	22	45.8	4.11	0.5
Ottumwa	84	25	47.8	4.42	1.0
Pacific Junction	74	22	44.7	5.36	0.5
Perry	78	23	45.0	5.44	
Plover	77	20	41.6	3.79	
Primghar	75	13	41.2	2.98	T.
Redoak	73	27	45.4	4.67	1.0
Ridgeway	83	19	44.8	1.77	0.7
Rock Rapids	75	18	43.2	1.11	
Rockwell City	78	23	43.8	4.35	
Sac City	75	21	43.2	3.00	T.
St. Charles	75	22	45.6	8.97	
Sibley	78	20	40.2	2.04	T.
Sigourney	86	22	46.6	3.92	0.5
Sioux Center	76	18	41.9	2.32	2.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Spirit Lake	80[e]	21[e]	44.8[e]	2.07	
Stockport	.....	.....	.....	3.10	2.0
Storm Lake	74	19	41.2	3.26	
Stuart	75	25	46.6	5.89	
Thurman	76	25	44.8	6.10	.....
Tipton	78	23	46.1	4.22	T.
Toledo	78	20	45.2	3.14	T.
Vinton	78	21	45.1	1.57	T.
Wapello	79	26	47.7	2.82	
Washington	81	22	46.3	2.74	
Washta	.....	.....	.....	3.45	2.0
Waterloo	74	19	43.2	2.74	0.5
Waukee	80	21	46.2	4.71	0.5
Waverly	73	21	43.6	2.33	0.9
Westbend	76	20	43.2	3.64	1.0
Whitten	75	19	43.4	2.71	T.
Wilton Junction	75	21	45.6	3.11	0.5
Winterset	79	21	45.7	6.41	0.8
Woodburn	.....	.....	.....	4.64	T.
Zearing	79	20	43.4	3.46	T.
Kansas.					
Achilles	81	16	49.2	2.70	T.
Alton	79	22	49.8	1.63	
Anthony	.....	.....	.....	3.72	
Atchison	76	28	49.2	5.79	1.0
Baker	74	22	46.2	5.17	2.0
Beloit	79	24	48.0	2.21	
Burlington	78	27	50.8	4.37	T
Chapman	75	26	51.2	3.71	1.3
Clay Center	78	24	50.0	3.47	T.
Coffeyville	88	20	56.7	.....	
Colby	80	20	49.4	3.78	5.0
Columbus	78	28	51.6	5.55	3.0
Cunningham	81	26	52.6	4.33	
Dresden	80	23	48.2	2.34	T.
Eldorado	79	28	52.4	1.55	T.
Ellinwood	81	23	52.0	2.84	
Emporia	78	27	51.6	3.15	T.
Englewood	92	24	56.1	1.30	
Enterprise	77	27	50.8	4.34	
Eureka	.....	.....	.....	4.13	0.3
Fall River	79	26	52.6	5.77	T.
Farnsworth	83	19	51.2	1.10	T.
Forsha	80	26	51.7	2.47	
Fort Leavenworth	78	28	50.4	5.66	2.0
Fort Scott	81	28	50.4	10.34	T.
Frankfort	76	22	48.6	5.08	2.5
Fredonia	80	29	52.6	4.60	1.0
Garden City	84	27	52.9	0.95	
Gove*[1]	79	25	48.6	1.79	.....
Grenola	80	27	51.6	3.74	T.
Harrison	77	24	48.0	3.01	
Hays	82	19	49.5	0.88	
Holton	76[d]	21[d]	48.6[d]	4.84	T.
Horton	74	25	47.8	5.19	2.0
Hoxie	82	22	51.3	2.06	
Hutchinson	82	25	50.6	3.77	
Independence	84	32	54.2	3.44	T.
Jetmore	85	.....	.....	1.57	
La Crosse	86	22	51.4	1.56	
Lakin	88	26	52.3	1.47	
Larned	81	15	49.8	3.02	
Lebanon	77	24	49.0	1.30	
Lebo	78	25	50.2	3.64	T.
Macksville	83	22	50.4	1.40	
McPherson	82	28	51.6	3.39	T.
Madison	78	23	50.8	4.02	1.0
Manhattan *b*	78	27	50.3	4.66	4.0
Manhattan *c*	79	21	49.0	5.02	4.0
Marion	76	27	51.7	3.30	4.0
Medicine Lodge	89	31	56.7	2.76	
Minneapolis	77	25	50.3	3.05	T.
Moran	77	27	51.0	8.38	1.5
Mounthope	78	30	52.8	2.14	
Ness City	82	23	53.2	1.80	
Newton	77	28	52.8	4.40	T.
Norton	82	21	49.4	3.02	
Norwich	81	27	53.4	2.27	
Oberlin	.....	.....	.....	4.10	
Olathe	78	28	50.2	5.48	3.0
Osage City	77	26	48.2	5.65	2.0
Osborne	.....	.....	.....	1.29	T.
Oswego	81	30	53.3	4.73	T.
Ottawa	78	22	49.2	5.73	0.2
Paola	78[e]	28[e]	50.2[e]	8.59	
Pleasanton	77	29	51.4	6.21	2.5
Republic	79	21	48.4	3.13	T.
Rome	81	28	54.5	2.26	
Salina	78	18	50.6	2.47	1.0
Sedan	81	31	53.6	4.20	
Toronto	81	25	50.1	6.72	
Ulysses	86[d]	25[d]	51.8[d]	0.60	
Valley Falls	75	25	48.4	3.16	2.0
Viroqua	86	22	52.1	0.66	
Wakeeney	.....	.....	.....	2.13	0.2
Wallace	84	29	50.9	1.75	0.6
Walnut	78	29	52.2	5.17	2.1
Wamego*[1]	76	30	48.7	5.62	T.
Kansas—Cont'd.					
Winfield	81	29	53.6	2.01	
Yates Center	82	27	51.2	5.87	0.7
Kentucky.					
Alpha	77	30	52.8	2.44	8.0
Anchorage	81	25	49.9	2.41	2.0
Bardstown	84	25	50.8	2.13	
Beattyville	82	20	49.0	2.35	T.
Beaver Dam	82	25	49.9	2.45	3.5
Berea	79	21	51.0	2.01	T.
Blandville	79	31	51.6	3.41	T.
Bowling Green	82	25	52.0	2.46	5.0
Burnside	82	25	53.4	2.89	2.0
Cadiz	85	30	52.2	2.86	.....
Calhoun	82	24	52.5	2.54	5.0
Catlettsburg	78	25	51.4	4.30	T.
Earlington	82	27	50.8	2.95	6.0
Edmonton	79	19	51.5	2.62	8.0
Eubank	80	20	49.2	2.50	
Falmouth	.....	.....	.....	3.00	
Fords Ferry	82	27	52.0	3.12	.....
Frankfort	74	27	50.6	2.90	T.
Franklin	83	30	54.8	.....	T.
Greensburg	84	17	48.3	2.78	3.0
Highbridge	80	24	50.7	1.90	T.
Hopkinsville	81	27	51.0	2.94	
Irvington	81	29	52.2	2.78	T.
Jackson	77	25	51.9	2.41	T.
Leitchfield	79	20	49.3	3.67	5.0
Loretto	81	19	50.2	1.96	
Manchester	78	21	50.6	2.70	T.
Mayfield	82	30	54.0	3.13	0.1
Maysville	76	24	48.3	3.81	0.3
Middlesboro	77[c]	16[c]	51.6[b]	.....	4.0
Mount Sterling	75	26	48.4	3.42	1.0
Owensboro	82	27	51.1	4.23	3.2
Owenton	77	26	48.3	2.74	
Paducah *a*	.....	.....	.....	2.80	.....
Paducah *b*	83	34	53.6	3.32	T.
Princeton	82	29	53.6	3.44	1.5
Richmond	81	24	50.0	3.38	
St. John	79	25	51.4	2.98	0.2
Scott	76	25	48.1	2.11	0.1
Shelby City	80	20	49.2	2.05	T.
Shelbyville	83	25	49.4	2.73	
Taylorsville	81	25	50.2	2.42	T.
Williamsburg	78	19	49.6	2.40	2.0
Williamstown	77	24	46.4	2.28	
Louisiana.					
Abbeville	88	40	68.1	2.20	
Alexandria	89	35	65.4	3.91	
Amite	88	37	64.6	1.80	
Baton Rouge	87	41	66.2	2.20	
Burnside	87	41	66.0	3.30	
Calhoun	85	36	62.4	3.50	
Cameron	80	43	67.1	5.39	
Caspiana	86	40	64.3	5.61	
Cheneyville	88	38	65.1	2.63	
Clinton	86	38	64.0	2.66	
Collinston	86	36	61.8	3.15	
Covington	88	40	66.9	1.73	
Donaldsonville	90	40	67.3	3.30	
Emilie	84	42	65.8	3.05	
Farmerville	86	38	61.5	3.57	
Franklin	88	38	67.0	1.85	
Grand Coteau	86	40	66.5	3.42	
Hammond	85	42	65.4	1.29	
Houma	87	38	66.6	1.88	
Jennings	85	38	65.8	4.86	
Lafayette	85	39	66.2	4.43	
Lakeside	86	43	67.0	2.66	
Lawrence	87	45	66.7	1.88	
Leesville	87	33	64.4	2.69	
Libertyhill	84	34	61.2	4.77	
Logansport	.....	.....	.....	4.97	
Mansfield	87	34	62.8	5.72	
Melville	89	40	66.0	2.92	
Minden	84	37	61.6	2.00	
Monroe	90	40	64.1	3.94	
New Iberia	84	44	67.3	3.15	
Opelousas	88	36	65.6	3.09	
Oxford	88	35	63.2	6.45	
Plain Dealing	86	31	60.9	6.14	
Port Eads	80	50	66.4	1.15	
Rayne	86	39	66.4	4.56	
Robeline	87	30	62.6	4.76	
Ruston	85	35	62.1	4.02	
St. Francisville	92	36	65.8	2.00	
Schriever	92	38	66.2	1.53	
Southern University	.....	.....	.....	2.15	
Sugar Experiment Station	85	46	67.0	2.17	
Sugartown	85	38	66.0	3.27	
Venice	83	41	65.4	1.51	
Wallace	89	40	66.8	1.83	
Maine.					
Bar Harbor	62	26	39.9	5.02	12.0
Belfast	64	15	39.5	5.06	12.0
Chesuncook	.....	.....	.....	2.52	.....
Cornish	67	16	40.8	7.67	17.0
Maine—Cont'd.					
Danforth	.....	.....	.....	2.86	4.0
Fairfield	62	16	40.6	5.75	6.0
Farmington	64	13	39.9	6.36	12.5
Fort Fairfield	69	5	38.9	1.35	T.
Gardiner	63	11	40.3	7.10	11.0
Grant Farm	.....	.....	.....	1.30	
Houlton	68	19	40.0	2.80	.....
Kineo	53[f]	17[f]	36.5[f]	1.54[f]	.....
Lewiston	63	20	40.8	6.74	16.0
Madison	62	18	41.8	7.63	6.5
Mayfield	58	13	38.2	3.42	12.0
Millinocket	66	16	39.5	2.82	4.0
North Bridgton	64	15	40.4	5.90	14.0
Oquossoc	58	6	35.2	4.56	20.0
Orono	62	16	41.0	2.31	3.5
Patten	65	9	37.8	2.90	2.0
Rumford Falls	63	20	39.9	5.72	19.5
South Lagrange	66	18	40.8	3.03	4.7
The Forks	.....	.....	.....	3.70	6.0
Thomaston	60	16	39.2	6.52	8.0
Vanburen	71	0	35.0	2.21	.....
Vanceboro	68	6	38.6	2.83	3.0
Winslow	64	17	40.6	5.38	7.0
Maryland.					
Annapolis	76	28	49.3	2.40	
Bachmans Valley	78	24	46.4	1.52	
Boettcherville	86	22	50.0	3.40	
Cambridge	87	29	52.4	2.68	
Charlotte Hall	82[e]	25[e]	51.9[e]	3.15	
Chase	81	23	48.4	3.24	
Cheltenham	80	26	49.8	2.70	
Chestertown	77	28	49.2	1.99	
Chewsville	81	20	46.8	1.36	T
Coleman	81	26	50.5	2.15	T.
Collegepark	81	22	48.6	.....	.....
Colora	.....	.....	.....	2.76	T.
Cumberland	.....	.....	.....	2.70	
Darlington	83[f]	25[f]	48.7[f]	2.33	T.
Deerpark	66[e]	10[e]	39.7[e]	3.89	4.5
Denton	74[b]	25	45.8[g]	4.10	T.
Easton	83	27	51.4	2.44	
Fallston	81	25	47.8	2.01	T.
Frederick	84	24	50.3	2.32	0.0
Grantsville	74	14	42.4	2.66	3.0
Greatfalls	84	22	49.6	2.33	
Greenspring Furnace	82	23	48.6	2.17	
Hancock	82	21	49.0	2.74	
Harney	.....	.....	.....	1.98	
Jewell	80	25	50.2	2.62	
Johns Hopkins Hospital	81	27	51.3	2.83	
Laurel	83	21	48.4	2.57	
McDonogh	80	19	47.7	1.29	
Mount St. Marys College	80	25	48.7	2.77	T.
New Market	80	23	49.3	2.19	T.
Oakland	76	11	43.2	2.27	3.0
Pocomoke City	79	28	52.9	1.95	
Prince Fredericktown	83	26	51.2	2.54	
Princess Anne	80	28	51.2	1.57	T.
Sharpsburg	79	25	48.9	2.08	
Solomons	79	30	51.1	1.74	
Sudlersville	84	27	51.4	2.57	T.
Takoma Park	84	24	48.6	2.63	T.
Van Bibber	79	27	49.3	2.39	T.
Westernport	72	23	47.4	2.02	1.2
Woodstock	80	25	50.5	1.75	
Massachusetts.					
Amherst	70	20	43.2	5.73	2.0
Bedford	69	21	43.6	7.39	6.5
Bluehill (summit)	68	20	43.0	8.53	5.0
Cambridge	69	23	45.0	9.28	.....
Chestnuthill	70	22	45.2	9.18	1.5
Concord	71	19	43.0	9.40	7.7
East Templeton*[1]	67	24	42.6	4.15	5.0
Fall River	65	24	45.1	9.41	1.0
Fitchburg *a*[1]	69	26	41.6	8.06	4.5
Fitchburg *b*	70	20	42.8	6.13	6.0
Framingham	73	20	45.2	8.78	1.8
Groton	70	19	42.5	8.60	9.0
Hyannis	.....	.....	.....	6.25	0.5
Jefferson	.....	.....	.....	7.70	7.0
Lawrence	71	20	43.0	7.22	4.0
Leominster	.....	.....	.....	8.05	7.2
Lowell *a*	69	21	44.6	9.32	.....
Lowell *b*	71	20	44.8	.....	.....
Ludlow Center	63	11	39.0	5.53	5.0
Middleboro	68	19	43.0	7.98	1.0
Monson	71	18	43.2	5.67	6.5
New Bedford	64	21	42.6	8.84	3.0
Pittsfield	.....	.....	.....	3.43	8.0
Plymouth*[1]	67	26	43.6	9.11	6.0
Princeton	.....	.....	.....	7.78	9.0
Provincetown	60	25	43.6	5.56	0.5
Salem	.....	.....	.....	9.43	4.0
Somerset*[1]	78	20	45.5	10.25	2.0
Sterling	.....	.....	.....	7.37	4.5
Taunton	67	20	43.1	8.54	.....
Webster	.....	.....	.....	6.90	2.8
Westboro	72	19	45.2	8.55	3.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Massachusetts—Cont'd.	°	°	°	*Ins.*	*Ins.*
Weston	70	19	43.2	9.58	2.2
Williamstown	64	22	40.7	2.22	5.8
Winchendon	.....	.....	.....	6.40	9.5
Worcester	70	23	43.8	5.95	2.4
Michigan.					
Adrian	75	18	42.6	0.68	.....
Agricultural College	78	15	39.4	0.50	T.
Allegan	82[d]	15[d]	38.9[d]	0.68	0.5
Alma	79	14	40.0	2.98	9.0
Ann Arbor	77	18	40.7	2.09	1.5
Arbela	75	11	40.0	4.71	17.0
Baldwin	79	4	40.2	1.70	15.0
Ball Mountain	76	15	39.0	2.54	8.7
Baraga	71	6	34.2	.....	.....
Battlecreek	78	19	41.0	1.10	T.
Bay City	76	12	38.6	2.75	12.0
Benzonia	78	16	36.8	2.70	7.6
Berlin	75	16	38.6	3.06	14.2
Berrien Springs	83	20	42.4	2.17	T.
Big Rapids	77	10	38.6	3.94	16.0
Birmingham	75	18	40.0	1.72	6.0
Bloomingdale[e]	79	15	41.6	.....	.....
Calumet	64	12	34.2	1.35	10.5
Carsonville[f]	73	18	38.2	0.82	8.0
Cassopolis	79	18	41.2	2.20	T.
Charlevoix	78	11	38.1	.....	5.0
Charlotte	79[b]	16[j]	42.8[k]	.....	.....
Chatham	61	4	32.0	0.49	3.3
Cheboygan	74	13	36.8	1.07	T.
Clinton	77	18	42.3	1.47	3.3
Coldwater	79	17	43.2	1.90	T.
Deer Park	66	2	30.4	1.40	T.
Detour[f]	67	14	35.2	1.39	2.0
Dundee	62	19	41.1	2.36	T
East Tawas	71[e]	12[e]	37.2[e]	1.30	T.
Eloise	76	18	41.4	1.01	0.5
Ewen	65	1	32.0	.....	.....
Fennville	76	.....	.....	2.49	T.
Fitchburg	78	13	40.2	2.43	9.0
Flint	77	14	37.7	2.35	8.5
Gaylord	72	.....	.....	1.05	6.0
Gladwin	72	10	39.2	2.55	13.7
Grand Haven	72	19	40.0	1.94	.....
Grand Marais	63[j]	7	31.7[e]	2.38	5.0
Grape	76	19	41.8	2.04	T.
Grayling	78	5	37.6	4.08	19.0
Hagar	80	17	39.4	2.24	T.
Harbor Beach	67	19	36.7	1.40	7.9
Harrison	76	9	37.3	2.80	12.0
Harrisville	62	13	35.7	2.54	12.6
Hastings	79	14	41.2	2.24	4.6
Hayes	79	29	39.4	2.79	15.0
Highland	.....	.....	.....	2.18	7.0
Hillsdale	77	16	41.0	1.76	.....
Humboldt	67	3	31.0	.....	.....
Iron Mountain	73	13	36.2	1.00	6.0
Iron River	73	6	34.8	1.60	2.0
Ironwood	65	10	34.6	0.73	3.5
Ishpeming	68	10	32.8	0.88	4.5
Ivan	74	5	33.2	3.00	15.0
Jackson	81	18	43.4	1.58	T.
Jeddo	73	14	39.1	1.88	5.5
Kalamazoo	78	18	42.0	3.39	.....
Lake City	74	12	42.0	.....	.....
Lansing	78	14	39.8	1.70	7.3
Mackinac Island	71	13	35.6	4.01	3.1
Mackinaw City	70	9	34.7	2.40	3.0
Mancelona	78	4	35.8	0.60	4.0
Marine City	70	18	39.8	1.86	4.5
Menominee	63	15	35.4	1.65	8.0
Midland	77	16	40.7	2.59	16.0
Mio	73	7	36.2	3.16	12.1
Montague	74	18	41.4	2.55	5.0
Mount Pleasant	76	.....	.....	.....	.....
Muskegon	72	19	41.0	2.02	4.5
Newberry	70[e]	5[e]	33.0[e]	.....	2.0
Old Mission	77	13	36.0	2.03	6.5
Olivet	76	18	41.1	1.84	4.0
Ovid	73	12	40.8	2.21	10.0
Owosso[d]	78	13	42.0	.....	6.0
Petoskey	80	14	37.0	1.92	8.0
Plymouth	78	18	41.6	.....	1.5
Port Austin	73[e]	20[b]	36.1[b]	0.90	T.
Powers	72	12	35.2	.....	.....
Reed City	78	18	39.8	3.80	16.3
Roscommon	77[j]	10[j]	39.4[j]	4.60	9.0
Saginaw (W. S.)	78	11	40.2	2.81	14.0
St. Ignace	70	10	36.0	0.87	.....
St. Joseph	75[e]	22[e]	39.0[e]	1.15	.....
Slocum	72	17	40.2	2.77	5.5
South Haven	70	11	37.6	1.90	T.
Thornville	74	18	42.0	1.88	14.0
Traverse City	77	6	35.2	2.22	11.0
Wasepi	78	17	41.7	2.27	.....
Webberville	79	14	39.3	2 42	13.5
West Branch[d]	74[j]	10	38.8	0.63	8.0
Wetmore	52[d]	4	29.0[b]	.....	.....
Whitefish Point	48	6	29.8	1.84	2.5
Michigan—Cont'd.					
Ypsilanti	76	17	40.8	1.66	0.8
Minnesota.					
Albert Lea	74	.....	.....	1.50	4.0
Alexandria	79	15	37.2	1.80	.....
Angus	76	9	36.5	0.58	.....
Ashby	73	17	38.1	1.94	1.0
Beardsley	77	19	39.2	2.50	.....
Beaulieu	77	9	37.0	2.88	9.0
Bemidji	69	11	36.4	0.59	.....
Bird Island	74	20	40.0	1.92	T.
Blooming Prairie	74	19	40.7	1.40	3.0
Brainerd	75	12	33.3	0.50	5.0
Caledonia	73	20	43.6	1.49	2.3
Collegeville	71	16	39.0	1.57	2.4
Crookston	73	13	36.1	3.90	14.0
Currie[e]	76	18	40.8	.....	.....
Deephaven	.....	.....	.....	2.06	.....
Detroit Ctiy	75	12	35.6	2.68	14.6
Faribault	73	12	40.1	1.83	3.2
Farmington	73	19	40.5	1.94	9.0
Fergus Falls	72	16	38.1	2.23	1.5
Glencoe	74	20	39.6	2.04	T.
Grand Meadow	80	17	41.3	1.86	3.0
Hallock	76	12	36.7	1.23	.....
Lake Winnibigoshish	72	11	34.3	0.92	2.6
Leech	74	12	36.0	1.23	3.0
Long Prairie	74	12	37.8	2.16	2.5
Luverne	74	18	41.2	2.02	T.
Lynd	74	17	40.3	1.57	T.
Mapleplain	76	18	40.3	2.36	6.2
Milaca	76	12	37.2	0.24	5.0
Milan	75[d]	18[d]	39.8[d]	1.64	.....
Minneapolis[d]	73[e]	19	40.4	1.74	6.7
Montevideo	75	20	40.8	1.51	T.
Morris	76	18	39.2	1.60	0.5
Mount Iron	75	10	34.4	0.42	1.0
New London	74	18	40.2	1.83	.....
New Richland	75	21	42.4	1.98	1.7
New Ulm	76	21	41.5	2.07	1.0
Park Rapids	70	7	33.6	2.30	17.0
Pine River	74	9	36.0	2.05	4.0
Pipestone	71	18	38.8	1.65	0.1
Pleasant Mounds	78	20	42.4	2.48	9.8
Pokegama Falls	75	4	34.2	1.03	4.2
Redwing[a]	.....	.....	.....	0.88	2.0
Reeds	.....	.....	.....	0.85	1.3
Rolling Green	73	18	41.4	1.40	T.
St. Charles	72	20	42.8	1.62	2.8
St. Cloud	74	17	41.2	1.37	2.0
St. Peter	75	20	42.1	2.08	.....
Sandy Lake Dam	71	12[d]	35.8[b]	0.98	4.7
Shakopee	74	20	41.4	1.99	.....
Tower	69	3	31.1	1.34	4.0
Two Harbors	61	14	35.2	0.52	0.3
Wabasha	80	20	43.4	1.83	2.8
Wadena	75	9	37.9	1.85	7.5
Willow River	77	11	36.9	1.08	4.4
Winnebago	76	20	42.6	2.75	1.9
Winona	82	22	41.8	1.52	0.7
Zumbrota	78	17	40.6	0.65	T.
Mississippi.					
Aberdeen	85	31	59.5	1.05	
Agricultural College	83	34	59.6	1.40	
Austin	81	35	58.8	3.72	
Batesville	83	34	56.6	2.87	
Bay St. Louis	83	46	66.4	1.31	
Biloxi	83	45	67.2	1.23	
Booneville	79	33	57.0	2.65	
Brookhaven	87	37	62.8	3.00	
Canton	86	37	61.0	3.01	
Columbia	87	38	63.2	0.80	
Columbus	81	35	58.2	1.84	
Corinth	78	34	54.4	3.24	
Crystal Springs	86	37	62.0	4.66	
Duck Hill	82	31	59.0	2.91	
Edwards	84	37	61.2	3.78	
Fayette	84	39	61.7	2.38	
Fayette (near)	.....	.....	.....	2.96	
Greenville[a]	84	39	61.2	3.45	
Greenville[b]	85	36	59.9	3.58	
Greenwood	86	33	59.0	2.49	
Hattiesburg	88	39	64.6	2.19	
Hazlehurst	86	37	62.6	6.35	
Hernando	78	32	56.5	3.89	
Holly Springs	77	34	55.3	4.02	
Indianola	86	34	61.2	2.52	
Jackson	86	37	61.4	2.81	
Kosciusko	84[e]	33[f]	60.0[f]	2.11	
Lake	86	33	60.2	3.53	
Lake Como	89	34	61.6	3.05	
Leakesville	89	39	65.3	1.31	
Louisville	84	35	60.0	2.48	
McNeill	90	42	66.5	1.60	
Macon	87	34	60.6	1.03	
Magee	86	31	61.8	3.92	
Magnolia	88	37	64.8	1.96	
Natchez	89	40	66.6	2.40	
Nitta Yuma	89	35	63.0	4.34	
Mississippi—Cont'd.					
Okolona	86	33	58.5	2.16	
Patmos	.....	.....	.....	3.18	
Pearlington	85	45	66.8	3.61	
Pittsboro	83	31	58.5	1.69	
Pontotoc	80	32	57.4	2.17	
Poplarville	85	43	65.9	1.46	
Port Gibson	87	38	63.8	4.13	
Ripley	81	30	55.8	3.90	
Shelby	88	.....	.....	3.04	
Shoccoe	88	32	60.8	2.78	
Stonington	.....	.....	.....	2.57	
Suffolk	87	38	63.8	2.92	
Swartwout	83	36	63.4	0.98	
Tupelo	83	34	56.2	2.76	
University	81	32	58.3	2.79	
Utica	86	38	62.7	3.69	
Walnutgrove	84	34	60.5	2.48	
Watervalley	82	33	57.6	2.50	
Waynesboro	88	36	63.3	3.65	
Woodville	86	40	65.1	1.64	
Yazoo City	85	36	60.8	2.35	
Missouri.					
Appleton City	77	24	49.4	8.23	1.5
Arthur	77	29	50.4	9.41	T.
Bagnell	.....	.....	.....	8.61	
Bethany	77	22	45.5	4.94	3.5
Birchtree	84	30	51.1	5.13	T.
Blue Springs	75	27	48.0	3.88	0.5
Boonville	.....	.....	.....	8.30	2.0
Brunswick	80	28	47.7	6.85	6.0
Caruthersville	79	34	54.6	3.28	
Conception	79	25	46.2	4.52	2.0
Darksville	79	22	47.0	6.27	5.5
Dean	80	27	52.7	2.93	1.5
Desoto	79	26	50.0	4.52	3.5
Downing	.....	.....	.....	5.83	3.0
Edgehill	81	24	50.1	5.93	
Fairport	.....	.....	.....	4.52	8.0
Fayette	75	25	46.0	6.98	6.0
Fulton	80	25	49.0	6.07	1.0
Gallatin	.....	.....	.....	9.05	4.0
Gano	79	26	50.6	4.99	0.5
Glasgow	79	27	47.6	6.41	5.0
Gorin	.....	.....	.....	5.20	3.5
Grant City	78	25	46.6	5.81	3.0
Halfway	78	28	50.8	6.66	T.
Harrisonville	78	27	48.1	4.63	3.0
Hazlehurst	.....	.....	.....	4.95	6.0
Hermann	.....	.....	.....	7.78	0.1
Houston	75	26	49.8	5.02	T.
Huntsville	79	28	47.8	6.47	8.0
Ironton	82	24	49.2	4.35	T.
Jackson	82	27	52.2	3.70	
Jefferson City	79	27	48.2	8.09	T.
Joplin	78	31	54.0	4.27	1.0
Kidder	75	26	46.7	5.01	3.0
Koshkonong	77	30	52.0	3.96	T.
Lamar	79	30	52.0	6.10	T.
Lamonte	.....	.....	.....	5.38	T.
Lebanon	77	30	49.8	7.22	
Lexington	77	28	48.9	6.52	2.0
Liberty	76	27	48.7	6.58	2.0
Lockwood	.....	.....	.....	4.52	0.6
Louisiana	80	19	47.4	6.04	7.0
Macon	79	27	47.4	7.81	10.9
Marblehill	82	27	52.0	3.32	
Marshall	78	27	47.6	6.80	4.0
Maryville	78	25	44.8	4.41	2.0
Mexico	79	26	47.7	7.02	4.8
Miami[e][b]	77	30	48.6	7.66	6.2
Mineralsprings	76	30	51.8	2.25	1.0
Monroe City	78	22	46.2	6.96	8.5
Montreal	77	22	48.4	8.21	2.4
Mountaingrove	74	28	49.6	4.17	T.
Mount Vernon	78	29	50.8	6.09	4.0
Neosho	78	29	53.1	4.05	2.0
Nevada	.....	.....	.....	11.03	T.
New Haven	82	30	50.1	6.74	2.0
New Madrid	.....	.....	.....	4.33	
New Palestine	78	29	49.8	7.35	2.0
Oakfield	80	28	49.3	4.78	5.5
Olden	78	27	52.1	5.58	
Oregon	77	25	47.8	6.09	4.0
Palmyra[e][b]	80	30	50.4	6.26	10.5
Pine Hill	.....	.....	.....	4.25	T.
Princeton	80	26	45.9	3.80	9.0
Protem	76	27	52.8	2.37	
Rockport	.....	.....	.....	7.75	2.0
Rolla	.....	.....	.....	7.10	T.
St. Charles	80	29	50.4	5.74	3.0
St. Joseph	.....	.....	.....	5.44	1.0
Sarcoxie	.....	.....	.....	3.93	T.
Sedalia	78	28	49.2	8.21	4.5
Seymour	83	25	49.7	3.82	1.5
Sikeston	78	28	52.4	4.36	
Steffenville	81	20	46.6	6.72	3.5
Sublett	83	25	46.1	5.65	7.4
Trenton	76	27	46.8	4.52	9.5

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Unionville	76	24	44.8	5.18	13.0
Vichy	78	25	49.0	6.80	T.
Warrensburg[1]	78	28	52.4	.....	.....
Warrenton	79	26	47.4	6.73	3.0
Warsaw	80	21	48.4	7.12	1.0
Wheatland	.....	.....	.....	8.87	3.0
Willowsprings	76	28	51.0	3.96	
Windsor	77	26	49.0	8.05	
Zeitonia	80	25	50.7	5.37	
Montana.					
Adel	71	11	41.3	0.40	T.
Anaconda	75	12	44.0	0.20	2.0
Augusta	79	16	44.8	0.50	1.5
Boulder	74	7	43.6	0.13	1.5
Bozeman	72	16	41.8	1.36	5.6
Butte	71	17	43.4	0.30	.....
Canyon Ferry	78	13	46.3	0.56	0.8
Chester	74	15	44.4	0.01	
Chinook	75	−3	43.2	0.58	T.
Columbia Falls	75	15	44.3	0.23	.....
Crow Agency	76	22	48.8	0.45	
Culbertson	86	3	38.8	0.45	.....
Cutbank	.....	6[i]	.....	0.79	.....
Deerlodge	74	18	40.8	.....	.....
Dillon	77	10	45.1	0.98	6.4
Fort Benton	75	22	44.4	0.64	1.2
Fort Harrison	80	22	53.1	.....	.....
Glasgow	83	8	41.3	0.75	.....
Glendive	85	14	40.9	0.55	0.5
Greatfalls	72	20	48.2	0.62	T.
Hamilton	80	26	49.2	0.68	0.2
Lamedeer	74	21	47.8	0.41	3.0
Lewistown	79	15	45.0	1.65	3.5
Livingston	78	17	46.4	1.06	2.0
Lodge Grass	88	21	52.4	0.54	
Marysville	73	11	40.9	0.95	1.8
Missoula	80	24	49.2	0.64	
Ovando	75	13	40.8	0.47	0.5
Parrot	79	13	47.0	0.27	0.9
Philipsburg	84	17	45.0	0.90	T.
Plains	76	24	49.2	T.	T
Poplar	88	13	40.7	0.80	1.0
Redlodge	70	12	41.2	2.43	4.0
Ridgelawn	87	15	41.4	0.74	0.2
Ruby	.....	.....	.....	0.90	9.0
St. Pauls	74	12	45.0	0.65	1.0
St. Peter	73	15	44.7	1.41	T.
Springbrook	85	14	41.1	1.25	1.0
Toston	80	14	47.0	0.47	2.0
Townsend	.....	.....	.....	0.51	.....
Troy	83	18	47.5	0.52	T.
Twin Bridges	79	10	45.6	0.10	T.
Utica	75	14	45.2	1.14	1.0
Wolf Creek	78	17	44.8	0.70	T.
Wolsey	70	8	37.2	0.85	8.8
Yale	71	16	44.0	0.90	1.0
Nebraska.					
Agate	82	12	43.8	0.70	1.0
Agee *1	82	16	41.9	1.57	.....
Albion	76	15	42.6	1.45	
Alliance	82	12	49.1	1.00	T.
Alma	82	22	48.9	2.41	
Ansley	77	14	44.1	1.84	T.
Arapahoe	.....	.....	.....	1.42	
Arcadia	.....	.....	.....	1.73	T.
Ashland *a*	77	23	46.0	4.46	
Ashland *b*	.....	.....	.....	5.17	
Ashton	.....	.....	.....	2.03	T.
Auburn	76	22	45.0	5.09	1.0
Aurora	77	22	48.6	3.03	T.
Bartley	82	11	49.9	1.33	
Beatrice	78	24	48.4	3.14	
Beaver	80	18	50.0	2.02	
Bellevue	.....	.....	.....	4.92	
Benkleman	.....	.....	.....	2.29	
Blair	75	19	44.6	3.15	1.0
Bluehill	.....	.....	.....	3.14	T.
Bradshaw	.....	.....	.....	5.82	
Bridgeport	83	15[c]	46.2[d]	0.67	
Broken Bow	75	16	45.6	1.47	T.
Burchard	.....	.....	.....	3.58	2.0
Burwell	.....	.....	.....	2.03	3.0
Callaway	79	15	47.4	0.51	
Central City	.....	.....	.....	2.40	
Chester	.....	.....	.....	3.67	1.0
Cody	.....	.....	.....	0.30	3.0
Columbus	74	20	45.2	1.67	
Crete	75	21	46.8	4.96	1.0
Crookston	.....	.....	.....	0.62	5.4
Culbertson	79	23	50.3	0.99	
Curtis	78	19	46.4	0.83	
David City	74	18	44.7	2.90	0.5
Dawson	77	24	47.6	5.45	T.
Edgar	.....	.....	.....	5.41	0.5
Ericson	.....	.....	.....	1.60	.....
Ewing	.....	.....	.....	1.56	3.5
Fairbury	77	22	46.0	2.55	2.0
Fairmont	74	20	44.8	3.85	1.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Fort Robinson	80[c]	15	46.2[d]	1.38	
Franklin	79	9	45.2	2.57	
Fremont	75	20	45.0	2.75	.....
Fullerton	.....	.....	.....	2.24	T.
Geneva	78	22	45.6	4.03	
Genoa (near)	80	16	46.8	1.78	0.5
Gering	82	11	46.6	1.38	
Gothenburg	79	18	47.8	0.65	
Grand Island *b*	76	13	43.6	1.99	
Grant	.....	.....	.....	1.60	T.
Greeley	.....	.....	.....	0.90	T.
Guide Rock	.....	.....	.....	2.32	T.
Halsey	82	13	46.5	0.55	T.
Harvard	74	20	44.1	4.49	T.
Hastings *1	74	25	45.8	3.25	T.
Hayes Center	.....	.....	.....	1.14	
Hay Spring	79	14	42.2	0.85	0.6
Hebron	80	24	47.0	4.54	0.5
Holbrook	.....	.....	.....	1.68	
Holdrege	77	23	48.0	1.93	
Hooper *1	77	23	44.2	2.26	.....
Imperial	81	21	48.8	2.71	
Johnstown	.....	.....	.....	0.70	
Kearney	80	19	47.2	2.51	.....
Kennedy	80[i]	11[d]	45.6[c]	0.15	0.2
Kimball	80	15	44.2	1.65	2.0
Kirkwood	81	12	45.0	1.14	2.0
Leavitt	80	20	45.0	2.34	.....
Lexington	79	18	45.6	1.24	
Lockridge	75	18	45.5	2.85	2.0
Lodgepole	82	15	45.8	1.05	.....
Loup	75	16	46.3	3.02	
Lynch	84	10	44.8	1.57	5.0
McCook	.....	.....	.....	0.85	
McCool Junction	.....	.....	.....	3.81	
Madison	75	18	42.6	1.81	2.0
Madrid	80	17	45.2	1.64	
Marquette	.....	.....	.....	2.41	T.
Mason	.....	.....	.....	1.83	
Minden	76	20	46.4	1.87	
Monroe	.....	.....	.....	1.68	T.
Nebraska City *c*	76	25	47.8	5.15	
Nemaha	.....	.....	.....	5.26	T.
Norfolk	79	14	43.2	2.00	2.0
North Loup	79	6	43.6	1.19	
Oakdale	77	17	43.0	2.00	5.0
Odell	.....	.....	.....	3.25	0.5
O'Neil	77	12[c]	44.8[c]	1.83	1.4
Ord	.....	.....	.....	1.72	
Osceola	.....	.....	.....	1.65	
Palmer	.....	.....	.....	1.85	
Palmyra	.....	.....	.....	5.00	
Pawlet	.....	.....	.....	0.97	
Pawnee City	76	22	47.0	7.37	1.0
Plattsmouth *a*	.....	.....	.....	5.24	.....
Plattsmouth *b*	.....	21	.....	5.30	1.0
Purdum	82	12	45.2	0.64	T.
Ravenna	75	18	46.2	2.05	T.
Redcloud	77	23	47.6	2.71	
Republican	.....	.....	.....	1.80	
Rulo	.....	.....	.....	4.09	
St. Libory	.....	.....	.....	2.03	
St. Paul	79	18	46.8	1.89	
Santee	84	16	46.1	2.63	5.5
Schuyler	.....	.....	.....	1.94	
Seward	74	13	45.8	4.70	0.5
Smithfield	.....	.....	.....	1.34	
Spragg	.....	.....	.....	0.80	1.5
Springview	78	13	45.2	1.20	2.0
Stanton	77	16	43.9	1.69	2.0
Strang	.....	.....	.....	5.10	3.0
Stratton	.....	.....	.....	1.50	
Stromsburg	.....	.....	.....	2.06	
Superior	76	11	45.4	2.62	T.
Syracuse	.....	.....	.....	4.64	
Tablerock	.....	.....	.....	5.97	1.0
Tecumseh	80	8	47.1	4.14	0.1
Tekamah	78	22	46.2	1.90	T.
Turlington	76	22	46.2	4.54	.....
University Farm	76	13	46.0	5.13	
Wahoo	.....	.....	.....	3.38	1.5
Wakefield	77	16	43.4	2.07	5.2
Wallace	.....	.....	.....	1.65	
Wauneta	.....	.....	.....	1.99	
Weeping Water	.....	.....	.....	4.42	3.7
Westpoint	84	17	45.3	2.44	3.0
Wilber	.....	.....	.....	3.75	2.0
Wilsonville	.....	.....	.....	2.67	
Winnebago	76	14	42.0	1.82	2.6
Wisner	.....	.....	.....	2.52	
Wymore	.....	.....	.....	4.42	3.0
York	75	26	48.2	3.48	.....
Nevada.					
Amos	84	22	48.2	0.41	
Austin	72	19	43.1	1.98	
Battle Mountain	93	25	51.9	0.50	
Belmont	71	11	42.2	0.49	.....
Beowawe *1	76	24	47.4	0.30	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nevada—Cont'd.	°	°	°	*Ins.*	*Ins.*
Candelaria	78	19	48.1	0.15	1.5
Carlin *1	82	28	45.7	1.01	2.0
Carson City	80	22	46.0	0.31	0.2
Cranes Ranch	.....	.....	.....	1.95	.....
Dyer	81	11	47.2	0.38	.....
Ely	76	13	43.1	0.81	4.0
Eureka	75	10	43.2	0.59	5.0
Fallon	83	20	49.4	T.	
Fenelon	85	20	41.8	.....	
Geyser	78[c]	10[c]	42.9[c]	0.07	0.5
Glenbrook	.....	.....	.....	0.91	
Halleck *1	84	24	49.8	1.47	6.0
Hamilton	70	10	38.0	0.56	5.6
Hawthorne	88	21	49.0	0.05	
Humboldt	75	22	48.0	0.85	2.5
Lewers Ranch	81	21	47.6	0.82	4.0
Lovelocks *1	88	20	50.4	T.	T.
Martins	97	20	51.8	0.37	
Mill City *1	84	28	53.6	0.05	
Morey	81	14	45.2	0.60	7.0
Palisade	82	18	43.8	0.82	3.0
Palmetto	76	14	43.6	1.15	5.0
Pioche	81	17	47.6	0.14	T.
Potts	77	10	40.2	0.72	8.5
Reno State University	78	22	46.2	0.35	T.
Sodaville	91	22	53.3	0.20	2.0
Tecoma	78	20	46.6	1.85	7.0
Toano *b	90	20	47.2	1.22	10.0
Wabuska	84	11	47.2	0.12	
Wadsworth *b	83	21	55.1	0.00	
Wells *1	69	28	43.3	0.39	3.0
Wood	80	19	45.2	1.35	.....
New Hampshire.					
Alstead	63	17	40.2	5.59	13.5
Bartlett	.....	.....	.....	3.95	21.5
Berlin Mills	63	4	38.0	3.33	.....
Bethlehem	64	12	39.2	3.01	22.0
Breton Wood	.....	.....	.....	1.40	.....
Brookline *1	70	20	43.4	9.13	10.0
Chatham	63	11	36.8	6.70	22.0
Concord	69	17	41.8	8.28	12.3
Durham	65	17	41.3	8.61	6.0
Franklin Falls	69	18	41.8	6.86	12.0
Grafton	69	12	40.4	6.05	15.0
Hanover	67	12	40.3	4.15	12.8
Jefferson Highlands	.....	.....	.....	3.37	18.0
Keene	68	15	41.2	5.02	10.5
Littleton	63	14	38.8	3.77	21.0
Nashua	71	20	44.0	8.15	8.8
Newton	70	13	41.9	8.59	6.5
North Woodstock	.....	.....	.....	2.57	.....
Plymouth	67	15	40.9	5.58	21.0
Stratford	65	10	37.5	3.20	19.0
West Stewartstown	.....	.....	.....	3.01	14.9
New Jersey.					
Asbury Park	77	24	46.1	4.24	T.
Barnegat	78[c]	19[c]	46.5[c]	4.16	T.
Bayonne	78	25	46.0	4.36	T.
Belvidere	80	22	47.3	1.78	1.0
Bergen Point	77	24	45.6	4.70	T.
Beverly	82	25	48.8	2.07	T.
Blairstown	78	22	46.4	2.90	
Bridgeton	85	23	50.2	2.86	
Canton	.....	.....	.....	2.67	T.
Cape May C. H	80	23	47.8	3.33	T.
Charlotteburg	74	17	43.4	4.41	T.
Chester	70	24	45.0	3.46	0.5
Clayton	80	25	47.7	2.00	T.
College Farm	81	23	46.5	3.49	T.
Dover	74	22	43.3	3.77	
Elizabeth	78	24	47.6	4.48	
Englewood	77	24	47.0	4.17	0.5
Flemington	80	25	46.9	3.76	T.
Friesburg	82	24	47.8	2.53	
Hightstown	80	25	47.7	4.52	2.0
Imlaystown	80	24	48.8	2.79	T.
Indian Mills	83	22	48.4	2.61	T.
Lakewood	79	23	47.0	3.70	
Lambertville	81	25	47.8	3.43	T.
Layton	70	16	43.6	2.58	T.
Moorestown	79	25	48.2	2.61	0.2
Newark	76	25	45.7	4.71	T.
New Brunswick	81	26	48.3	3.48	0.2
Newton	77	21	44.3	3.60	0.5
Paterson	79	26	48.3	4.19	T.
Pemberton	78	23	47.8	3.49	T.
Phillipsburg	77	24	46.4	2.53	0.5
Plainfield	78	25	46.3	3.27	T.
Rancocas	.....	.....	.....	2.46	T.
Ringwood	77	20	44.8	3.19	T.
Rivervale	72	20	45.6	4.22	
Salem	81	26	49.6	3.03	T.
Sandy Hook	76	26	45.0	3.65	1.5
Somerville	80	23	46.2	3.36	T.
South Orange	77	25	45.8	3.81	T.
Sussex	75	22	45.6	3.53	T.
Trenton	79	29	51.2	3.50	T.
Tuckerton	79	20	46.0	3.94	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Jersey—Cont'd.	°	°	°	*Ins.*	*Ins.*
Vineland	83	21	48.4	3.37	T.
Woodbine	78	21	46.4	4.29	T.
Woodstown				2.94	
New Mexico.					
Alamagordo	90	27	59.8	0.00	
Albert	89	26	56.0	0.13	T.
Albuquerque	83[a]	30[a]	58.2[a]	T.	
Arabela	84	25	57.2	T.	
Bellranch				0.28	
Cambray				0.02	
Deming				0.00	
Dorsey	83	19	48.8	1.04	T.
Eagle Rock Ranch	79	17	48.0	1.13	12.0
Fort Bayard	84	32	57.2	0.00	
Fort Stanton	81	23	50.6	0.15	
Fort Union	79	14	46.7	0.32	
Fort Wingate	78	21	50.8	0.30	3.0
Fruitland	92	20	54.5	T.	
Gage				0.00	
Golden				0.02	0.2
Las Vegas	82	18	49.0	0.24	1.0
Lordsburg				0.00	
Los Lunas	86	30	58.0	0.10	
Mesilla Park	91	29	60.8	0.00	
Mountainair	78	20	49.8	0.14	0.5
Raton	81	18	48.8	0.60	2.0
Roswell	91	27	59.6	0.07	
San Marcial	97	25	62.1	T.	
Strauss				0.00	
Taos	81	20	49.4	0.15	
Winsors	69[c]	12[c]	40.8[c]	0.31	
New York.					
Adams				4.20	26.0
Addison	69	19	41.3	2.27	3.5
Akron				3.12	
Alden	72	13	39.6	4.27	24.1
Amsterdam	68	20	41.1	2.64	6.0
Angelica	70	6	39.0	1.97	7.8
Appleton	71	21	39.6	2.49	
Arcade	68	12	37.0	3.02	10.5
Athens	71	24	44.8	3.38	2.5
Atlanta	68	12	38.7	2.99	11.0
Atwater				3.35	11.2
Auburn	70	18	41.4	4.08	16.0
Avon	71	15	39.6	2.37	16.0
Ballston Lake	68	20	41.9	3.12	9.6
Bedford	76	13	43.7	4.55	
Berlin	68	15	42.4	3.70	T.
Blue Mountain Lake				3.30	21.0
Bolivar	67	13	38.8	2.37	6.9
Bouckville	67	13	39.2	3.80	14.0
Boyds Corners				4.23	
Brockport	74	14	40.8	2.63	13.3
Caldwell	65	18	40.4	3.16	8.5
Canajoharie	72	18	39.7	2.76	9.2
Carmel	68	22	42.6	4.80	0.2
Carvers Falls	69	17	41.5	2.93	5.0
Chazy	64	22	41.9	2.75	3.0
Cooperstown	67	16	38.4	2.84	7.0
Cortland	67	16	40.3		
Cutchogue	67	26	45.2	6.28	2.0
Deansboro				3.05	7.5
Dekalb Junction	70	19	40.2	3.11	12.7
De Ruyter	66	9	38.3	3.82	15.9
Easton				2.00	7.0
Elba	65	10	38.2	7.17	39.0
Elmira	71	20	43.2	2.77	
Faust	67	10	36.7	1.67	9.5
Fayetteville	70	18	42.0	3.37	12.0
Fort Plain	70	22	43.8	2.93	8.0
Franklinville	68	15	37.6	4.03	9.6
Gabriels	67	7	35.4	2.13	10.0
Gansevoort				4.47	11.0
Glens Falls	66	19	42.5	3.38	8.5
Gloversville	65	17	39.6	4.28	7.0
Greenwich	67	18	41.6	2.37	6.0
Griffin Corners	65	11	37.6	2.98	1.2
Harkness	65	21	41.2	2.78	6.8
Haskinville				2.03	12.0
Hemlock	62	21	39.8	2.32	10.3
Indian Lake	62	11	34.8	2.44	8.6
Ithaca	69	19	40.2	2.93	5.4
Jamestown	71	16	40.0	3.75	10.8
Jeffersonville	69	18	41.6	3.76	T.
Keene Valley	67	16	38.9	2.86	10.0
Le Roy	69	14	40.0	5.18	23.6
Liberty	64	14	38.8	3.72	21.0
Littlefalls, City Res.	65	16	39.3	2.64	4.0
Lockport	71	19	40.2	2.43	
Lowville	65	15	38.0	2.52	13.3
Lyndonville				2.13	1.0
Lyons	70	15	41.6	5.58	27.0
Middletown	70	22	44.4	3.66	T.
Mohonk Lake	69	19	41.6	3.75	0.5
Moira	72	19	41.4	3.13	12.3
Newark Valley				3.16	4.5
New Lisbon	68	12	38.0	2.59	7.0
North Hammond	68	20	40.8	2.96	4.1
North Lake				3.24	27.0
Number Four	62	5	36.0	3.35	22.1
Ogdensburg	68	18	39.8	2.08	7.0
Old Chatham				3.78	5.0
Oneonta	67	17	41.9	3.59	6.0
Oswegatchie	68	13	38.0	3.52	12.4
Otto	68	12	38.2	3.05	
Oxford	69	16	40.9	3.09	7.2
Oyster Bay	72	26	46.9	5.02	
Palermo				4.06	24.7
Perry City	70	15	39.2	3.54	14.2
Plattsburg Barracks	62	16	39.6	2.56	1.0
Port Jervis	74	20	45.2	3.31	T.
Potsdam	73	19	41.2	3.40	12.5
Primrose	78	20	45.5	5.68	T
Redhook				3.51	
Richmondville	70	18	40.4	2.47	6.6
Ridgeway	70	19	40.4	2.74	9.3
Ripley	72	20	39.8	4.40	5.0
Rome	70	15	42.5	3.49	2.5
Romulus	70	19	41.3	3.75	11.5
Salisbury Mills				5.51	
Saranac Lake	67	12	37.6	2.59	16.4
Saratoga Springs	68	20	41.3	4.12	6.0
Scarsdale	77	22	46.0	3.02	0.5
Scottsville				2.98	
Setauket	72	26	45.2	6.26	0.5
Shortsville	71	17	40.2	2.62	12.0
Skaneateles				3.39	8.6
Southampton	62	24	43.6	7.17	0.5
South Butler				2.83	17.0
South Canisteo	68	18	39.5	2.81	7.5
Southeast Reservoir				4.03	
South Kortright	68	12	39.2	1.99	4.0
South Schroon	64	14	38.5	3.29	17.0
Spier Falls	68	19	41.7	3.07	8.0
Straits Corners	68	14	39.6	4.15	3.6
Ticonderoga	63	22	41.8	1.47	8.0
Volusia	69	12	37.6	2.96	11.0
Wappinger Falls	76	19	44.5	3.96	T.
Warwick				3.34	1.0
Watertown	69	20	40.8	2.53	13.0
Waverly	73	18	42.6	2.57	0.9
Wedgwood	64	16	38.3	3.87	10.5
Wells	65	9	37.9	3.86	13.0
West Berne	67	12	38.0	3.31	8.5
Westfield *b*	70	20	39.5	2.30	5.5
Windham	67	15	40.0	3.21	4.0
Youngstown				1.83	11.0
North Carolina.					
Brevard	77	21	51.3	1.85	T.
Bryson City				3.42	
Currituck				1.01	
Eagletown				0.89	
Edenton	82	31	56.2	0.50	
Fayetteville	85	28	58.5	0.53	
Goldsboro	87	30	58.8	1.09	
Graham				1.29	T.
Greensboro	84	29	53.8	1.51	
Henderson	82	29	54.8	0.94	
Hendersonville	78	20	50.3	2.13	T.
Henrietta	83[f]	26[e]	55.4[e]	1.13	T.
Horse Cove	72	22	49.0	3.97	T.
Hot Springs	79	29	51.9		4.0
Jefferson	72	18	47.0	2.41	0.2
Kinston	88	28	58.6	0.82	
Kittyhawk	79	34	55.8	2.91	
Lenoir	81	22	50.6	1.31	T.
Lincolnton	79	26	54.6	1.18	2.0
Linville	70	11	41.4	3.11	2.0
Littleton	85[e]	26[b]	53.0[e]	1.17	
Louisburg	85	28	56.0	0.45	
Marion	83	25	53.4	2.24	T.
Marshall	80	23	48.8	2.21	1.5
Moncure	86	25	56.2	1.20	
Monroe	84	22	55.7	0.85	T.
Morganton	82	23	52.8	0.98	0.8
Mountairy	85	23	48.8	1.71	
Murphy				2.92	
Newbern	82	30	58.8	1.65	
Patterson [a]	78	21	48.2	1.66	
Pittsboro				1.06	
Reidsville	83[e]	27[e]	53.6[e]	1.45	
Rockingham	85[f]	29[e]	58.4[e]		
Salem	84	26	54.0	1.42	
Salisbury	84	30	60.2	1.27	
Saxon	85	24	51.6	1.75	
Selma	86[e]	28[e]	58.0[e]	1.30	
Settle	83	26	55.2	0.84	
Sloan	84	27	58.5	1.48	
Soapstone Mount	84	23	53.9	2.55	T.
Southern Pines *a*	86	31	59.0	1.11	
Southern Pines *b*	86	32	59.8	1.10	
Southport	79	37	59.9	1.69	
Springhope	85	29	57.1	1.10	
Statesville	83	23	54.2	1.55	
Tarboro	88	27	57.6	1.17	
Washington	86	30	59.8	1.33	
Waynesville	75	15	47.6	3.15	2.0
Weldon *a*	86	27	55.6	1.04	
Weldon *b*				1.04	
Whiteville	83	26	58.6	1.80	
North Dakota.					
Amenia	77	13	38.0	2.27	3.2
Ashley	79	10	38.0	2.34	8.0
Berlin	78	10	37.0	3.30	29.5
Bottineau	77	11	35.0	0.13	T.
Buxton [k]		8	31.3	2.51	25.1
Cando	85	13	33.6	1.37	5.5
Churchs Ferry	78	15	36.0	0.89	3.2
Coalharbor	81	16	40.4	1.34	12.4
Devils Lake	72	15	35.2	1.52	8.7
Dickinson	84	15	41.2	0.92	3.0
Donnybrook	80	14	37.8	0.30	2.5
Dunseith	78	10	35.0	0.78	4.0
Edgeley	80	12	39.0	3.30	4.0
Elbowoods	84	12	35.5	1.15	0.5
Ellendale	85	13	38.6	2.30	12.0
Fargo	78	14	36.6	2.74	11.1
Forman	83	14	38.2	2.59	8.0
Fort Yates	83	12	41.4	0.56	T.
Fullerton	78	13	37.6	3.45	21.2
Glenullin	82	9	39.9	1.41	4.0
Grafton	75	10	36.8	1.20	9.0
Hamilton	72	10	35.2	2.06	11.3
Hannaford	76	7	36.6	0.18	1.8
Jamestown	78	15	39.4	1.85	8.7
Kulm	79	14	38.3	2.20	11.5
Lamoure				2.38	
Larimore	73	8	33.8	2.32	14.0
Lisbon	80	11	36.8	4.18	20.0
Manfred	81	11	37.8	1.59	8.5
Medora	85	17	42.0	0.30	3.0
Melville	78	14	36.8	0.15	1.5
Milton [g]	71	2	35.2	2.78	
Minnewaukon	78	15	36.8	0.74	5.6
Minot	85	5	37.9	2.90	14.0
Minto	75	7	36.0	1.59	9.7
Napoleon	81	10	37.8	2.37	10.0
New England	81	13	39.2	0.32	3.2
Oakdale	84	10	39.0	0.85	5.0
Palermo	80			1.54	10.0
Park River	75	8	37.5	2.05	10.5
Pembina	76	12	35.7	1.09	6.4
Power	76	10	37.4	2.82	10.0
Rolla	75	10	34.5	0.98	2.3
Steele	79	11	39.0	0.75	7.0
University	72	10	37.6	1.53	7.3
Wahpeton	80	10	39.5	2.83	12.1
Willow City	78	15	36.6	1.06	7.0
Wishek [b]	91	17	40.6	1.60	4.0
Ohio.					
Akron	70	16	42.6	4.15	1.1
Amesville	76	20	48.4	2.65	1.1
Atwater				6.25	1.5
Bangorville	77	18	43.2	4.73	1.2
Bellefontaine	76	13	42.2	4.55	2.6
Benton Ridge	77	20	44.3	3.52	0.2
Bladensburg	76	18	43.6	6.24	T.
Bowling Green	77	19	43.6	2.46	T.
Bucyrus	76	20	42.8	4.75	
Cadiz	75	15	44.7	4.65	2.9
Cambridge	78	18	46.2	2.83	T.
Camp Dennison	78	22	48.3	2.48	T.
Canal Dover	74	18	44.2	4.63	0.5
Canton	72	17	42.4	5.67	2.3
Cardington	77	20	43.0	4.60	1.0
Circleville	77	23	46.4	2.53	2.0
Clarington	79	21	47.5	3.39	1.1
Clarksville	75	23	46.6	3.45	0.4
Cleveland *a*	70	23	42.4	3.30	0.7
Cleveland *b*	72	23	40.7	1.54	T.
Coalton	75	18	47.9	2.21	T.
Colebrook				2.70	
Dayton *a*				2.36	2.0
Dayton *b*	77	22	45.4	3.18	2.8
Defiance	78	18	43.1	2.61	T.
Delaware	78	20	44.0	4.05	0.8
Demos	75	20	45.8	3.31	0.2
Elyria	77	21	43.2	3.11	0.5
Findlay	80	20	43.6	2.90	T.
Frankfort	79	22	48.6	2.23	T.
Fremont	79	22	44.5	3.36	T.
Garrettsville	72	15	41.6	4.27	0.8
Granville	75	21	44.8	3.90	0.5
Gratiot	73	20	45.1	3.38	1.7
Green	75	24	49.2	3.36	T.
Greenfield	73	25	46.9	2.11	T.
Greenhill	71	9	41.6	5.19	1.3
Greenville	80	20	44.4	4.49	0.5
Hanging Rock	76	21	50.6	2.59	
Hedges	77	17	45.4	2.21	T.
Hillhouse	71	11	39.2	3.75	0.5
Hiram	70	19	41.3	4.11	0.5
Hudson	72	17	42.2	3.94	
Jacksonboro	77	24	45.4	2.83	T.

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Kenton	78	19	44.7	5.58	1.2
Killbuck	75	17	43.2	4.20	0.5
Lancaster	79	21	45.9	2.55	1.0
Lima	77	19	44.4	5.99	T.
McConnelsville	73	20	45.5	3.33	2.2
Manara	74	18	45.8	2.63	2.0
Mansfield				6.25	1.0
Marietta	74	24	49.6	2.48	1.0
Marion	80	19	43.9	5.06	T.
Medina	75	16	42.2	3.83	T.
Milfordton	76	18	42.6	4.37	1.0
Milligan	74	13	45.6	3.20	2.0
Millport	73	7	42.4	4.33	3.0
Montpelier	78	19	43.5	3.34	T.
Napoleon	77	20	44.4	2.24	T.
Nellie	73	21	44.4	4.27	T.
New Alexandria [d]	78	16	44.3		
New Berlin	70	15	42.8	5.79	T.
New Bremen	78	20	44.8	6.13	1.5
New Richmond	75	25	48.8	2.18	0.1
New Waterford	75	10	42.8	5.72	T.
North Lewisburg	77	20	44.8	4.14	1.0
North Royalton	73	18	41.6	2.79	T.
Norwalk	80	21	42.5	3.68	T.
Oberlin	76	19	42.6	2.68	T.
Ohio State University	75	19	43.6	2.98	1.8
Orangeville	69	16	42.4	3.75	0.5
Ottawa	80	19	45.0	3.91	T.
Pataskala	75	20	44.6	3.23	1.3
Philo	74	19	46.1	2.41	0.6
Plattsburg	75	20	44.6	3.47	T.
Pomeroy	77	22	46.5	2.86	0.8
Portsmouth *a*				3.55	1.0
Portsmouth *b*	77	25	49.1	2.31	1.0
Pulse	72	24	47.0	2.45	T.
Richwood	77	20	43.8	4.04	T.
Rittman	75	17	42.2	4.55	0.5
Rockyridge	78	20	43.3	1.70	T.
Shenandoah	74	18	41.3	4.66	0.4
Sidney	81	22	46.1	4.23	0.4
Somerset	76	21	45.8	3.73	1.5
Springfield				2.34	1.0
Thurman	77	20	49.2	2.50	T.
Tiffin	77	21	43.4	3.15	0.2
Upper Sandusky	79	20	44.4	6.12	1.0
Urbana	73	20	42.4	3.58	T.
Vickery	78	21	43.4	3.09	T.
Warren	74	21	42.0	3.83	0.9
Wauseon	78	19	42.2	2.82	0.2
Waverly	77	21	47.0	2.63	4.0
Waynesville	76	23	46.4	2.54	
Wellington	77	20	43.4	3.47	T.
Willoughby				2.42	
Wilson	78	20	47.1	1.81	T.
Wooster	72	12	42.8	6.59	2.2
Zanesville				2.53	0.5
Oklahoma.					
Arapaho	97	28	60.0	1.24	
Beaver	90	29	56.2	0.99	
Binger	94	27	59.8	1.23	
Chandler	90	31	58.4	0.95	
Cleo	94[f]	23[e]	58.8[f]	5.06	
Cloud Chief	97	29	58.1	2.72	
Eldorado	100	30	64.8	0.80	
Enid	90	30	56.4	2.11	
Fort Reno	93	30	59.9	1.50	
Fort Sill	92	33	61.8	1.20	
Grand				2.20	
Guthrie	90	35	59.0	1.00	
Harrington	94	31	59.3	2.18	
Hennessey	94	29	58.2	4.12	
Hobart	98	31	61.4	0.95	
Jefferson	86	31	55.6	4.88	
Jenkins	89	26	56.5	2.17	
Kenton	86	25	53.0	0.58	T.
Kingfisher	95	30	59.9	1.55	
McComb	90	29	59.8	1.53	
Mangum	100	38	63.6	2.10	
Meeker	93	29	59.0	2.50	
Newkirk	94	31	58.6	2.83	
Norman	95	29	60.6	0.75	
Pawhuska	84	30	55.7	1.50	
Perry	88	28	57.4	3.02	
Sac and Fox Agency				1.10	
Shawnee	92	33	58.6	1.29	
Stillwater	87	29	56.0	0.80	
Taloga	94	26	56.6	2.79	
Temple	94	33	63.4	1.75	
Watonga	94	25	57.9	5.00	
Waukomis	91	27	58.8	3.48	
Weatherford	94	26	57.3	1.67	
Whiteagle	85	31	57.2	3.35	
Oregon.					
Albany				1.90	
Alpha	94	31	51.8	7.48	2.5
Arlington	85	30	55.8	0.66	
Ashland	88	30	51.5	2.88	1.0
Astoria	80	35	53.4	5.22	
Oregon—Cont'd.					
Aurora (near)	89	28	52.9	1.93	
Bay City	80	31	59.7	8.41	
Bend	80	23	46.6	2.43	
Beulah	81	22	46.5	2.72	
Blackbutte	84	30	48.8	3.40	
Blalock	88	34	58.1	1.04	
Bullrun				5.86	
Burns	78[i]	25[i]	48.8[i]		3.0
Burns (near)				2.00	5.0
Butter Creek				0.30	
Cascade Locks	83	31	53.5	3.45	
Coquille				3.36	
Corvallis	86	30	53.2	1.82	
Dayville	91	28	52.6	1.26	
Detroit				4.40	1.0
Doraville	89	31	51.8	4.48	
Drain	92	32	54.3	3.26	
Ella				0.70	
Eugene	84	32	52.4	3.83	
Fairview	94	32	52.8	4.53	T.
Falls City				4.63	
Forestgrove	87	30	53.8	2.78	
Gardiner	93	35	54.4	6.83	
Glenora	89	30	49.6	8.75	
Gold Beach	92	37	53.6	5.91	
Government Camp	70	15	40.3	3.63	15.0
Grants Pass	91	29	52.9	2.40	T.
Hood River (near)	86	28	52.4	1.46	
Huntington	82	27	52.0	1.61	
Jacksonville	91	28	54.2	2.93	T.
Joseph	85	23	47.4	1.36	0.8
Kerby	90	29	59.7	2.95	T.
Klamath Falls [e]	78	17	47.2		
Lagrande	81	28	49.2	1.07	
Lakeview	79	10	42.9	2.76	17.5
Langlois	85			6.78	
Lonerock	78	24	48.2	1.15	
McKenzie Bridge	93	25	51.1	5.00	
McMinnville	87	31	53.8	1.80	
Meacham				1.96	
Monroe	85	30	52.8	1.89	
Mount Angel	85	31	53.9	2.77	
Nehalem				5.59	
Newport	86	35	51.4	4.67	
Ontario				0.72	
Paisley	81	22	49.2		4.0
Pendleton	92	28	56.7	0.75	
Pine	83	22	48.3	0.67	
Prineville	82	20	48.4	1.66	
Riverside	83	23	51.4	1.60	3.0
Salem	87	33	53.8	1.68	
Silverlake [d]	82	16	45.6	0.98	1.0
Sparta	72	22	45.7	1.77	
Stafford	87	28	53.5	3.37	
The Dalles	83	31	55.3	0.98	
Toledo	92	33	51.4	5.90	
Umatilla	86	30	57.6	0.51	
Vale	81	25	50.4	1.88	
Wallowa	81	23	48.2	0.75	
Wamic	80	23	49.8	2.15	
Warm Spring	84	22	52.4	1.88	
Williams	92	28	51.6	1.82	T.
Pennsylvania.					
Aleppo	76	17	46.0	3.98	1.0
Altoona	73	19	43.8	4.40	T.
Beaver Dam				4.33	2.0
Bellefonte	81	20	47.1	4.38	1.5
Brookville				6.14	
Browers				1.66	
California	80	21	47.4	3.99	0.7
Cassandra	68	13	41.2	1.58	2.0
Centerhall	71	20	43.2	5.18	1.0
Clarion				5.72	0.2
Claysville	76[e]	9[e]	46.0[e]	3.08[e]	2.0
Coatesville	81	24	47.6	2.22	0.6
Coudersport	64	15	39.4	3.35	T.
Confluence				3.20	
Davis Island Dam				3.29	
Derry	78	15	45.2	4.74	
Doylestown				3.61	
Earlston	74	21	44.6	3.55	0.5
East Bloomsburg				3.29	0.1
East Mauch Chunk	79	21	45.4	2.89	1.0
Easton	76	24	46.3	3.35	0.2
Ellwood Junction				5.66	1.0
Emporium	67	20	42.0	4.74	T.
Ephrata	78	21	47.4	2.46	0.3
Forks of Neshaminy				2.59	
Frankford	79	24	48.2	2.30	T.
Franklin	73	15	42.7	4.11	T.
Freeport	69[e]	20[e]	44.0[e]	4.60	1.0
Gettysburg	80	24	50.3	2.48	
Girardville				3.42	1.0
Gordon	77	18	44.6	3.56	1.0
Greensboro				3.46	0.2
Greenville	72	19	42.6	3.45	1.0
Hamburg	78	22	47.0	3.06	1.0
Pennsylvania—Cont'd.					
Hanover	86	21	48.4	1.36	T.
Herrs Island Dam				3.37	2.0
Huntingdon *a*				4.44	T.
Huntingdon *b*	74	19	45.0	4.05	1.3
Indiana	75	17	43.6	4.98	2.2
Irwin	78	11	46.2	4.64	1.5
Johnstown	74	23	46.4	4.45	0.8
Keating				4.40	T.
Kennett Square	79	25	47.7	2.65	T.
Lansdale				2.73	
Lawrenceville	68	17	41.0	2.95	T.
Lebanon	80	24	47.2	2.48	0.2
Leroy	67	16	40.8	3.15	0.6
Lewisburg	79	23	45.5	3.78	0.2
Lockhaven *a*	77	21	46.2	4.52	T.
Lockhaven *b*				4.86	
Lock No. 4				3.57	0.1
Lycippus	76	19	45.5	2.74	0.8
Marion	79	24	46.8	2.54	
Mifflin				4.75	
Mifflintown	76	22	46.1	4.42	T.
Milford	74	12	43.6	3.09	0.5
Montrose	65	12	40.4	3.22	4.6
New Germantown	77	22	45.8	3.69	0.3
Oil City				4.50	0.7
Ottsville				2.63	
Parker				6.42	0.9
Philadelphia	79	27	50.2	1.89	T.
Pocono Lake	68	16	39.6	2.74	3.0
Point Pleasant				2.96	
Pottsville				2.92	
Quakertown	80	21	46.7	2.45	T.
Reading	80	26	48.1	2.46	
Renovo	75	22	44.0	4.06	0.8
Saegerstown	71	11	40.4	3.92	2.0
St. Marys	62	17	40.0	3.25	1.0
Saltsburg				5.17	2.1
Seisholtzville				2.69	
Selinsgrove	81	20	47.3	3.70	1.0
Shawmont				1.34	
Skidmore	75	11	43.2	5.01	T.
Smethport	66	11	39.0	2.34	2.0
Smiths Corners				2.68	
Somerset	74	15	41.6	5.81	5.4
South Eaton	70	20	44.5	3.21	T.
Springmount				2.28	
State College	66	19	42.5	5.42	0.4
Swarthmore	79	25	47.9	2.07	
Towanda	68	20	43.0	2.48	0.5
Troutrun				5.30	
Uniontown	81	18	46.9	3.72	5.7
Warren	71	15	41.0	4.27	1.0
Wellsboro	72	20	41.6		T.
Westchester	79	24	47.2	2.34	T.
West Newton				4.52	1.0
Wilkesbarre	72	21	45.1	2.34	0.5
Williamsport	74	23	45.8	3.63	T.
Rhode Island.					
Bristol	59	25	43.8	8.33	1.0
Kingston	66	20	43.0	9.70	1.5
Pawtucket	68	24	45.0	8.71	T.
Providence *a*	67	26	47.0	9.45	2.5
Providence *c*	66	22	44.6	9.34	2.0
South Carolina.					
Aiken	85	32	59.5	1.45	
Allendale	86	41	63.4	0.60	
Anderson	83	32	59.8	1.95	
Barksdale	83	32	58.3	1.74	
Batesburg	87	32	57.4	2.43	
Beaufort	86	40	63.2	0.83	
Bennettsville	85	30	60.3	2.12	
Blackville	86	33	61.0	0.63	
Bowman	87	32	61.2	1.48	
Calhoun Falls				1.44	
Camden				1.41	
Cheraw *a*	84	30	58.0	1.41	
Cheraw *b*				2.12	
Clarks Hill	82	35	59.2	1.20	
Clemson College	84	26	57.6	1.61	
Conway	86	31	60.2	1.05	
Darlington	85	29	60.0	1.37	
Dillon	85	28	59.8	1.02	
Due West	85	32	59.9	1.80	
Effingham				1.50	
Florence	85	29	60.0	1.37	
Gaffney	85	28	56.4	1.66	T.
Gillisonville	89	32	61.9	1.77	
Greenville	80	25	53.1	2.29	
Greenwood	82	34	56.6	1.64	
Heath Springs	84	25	54.8	1.02	
Kingstree *a*	84	34	58.6	0.75	
Kingstree *b*				0.76	
Liberty	84	28	57.9	2.45	T.
Little Mountain	84	33	60.0	1.36	
Lugoff	86	26	59.6	1.30	
Newberry	83	28	58.6	1.16	T.
Pinopolis [e] [1]	83	37	59.1	1.01	
St. Georges	85	37	60.0	1.02	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
St. Matthews	83	33	59.0	1.14	
St. Stephens	.....	.....	.....	2.21	
Saluda	85	27	58.8	1.77	T.
Santuck	84	25	57.2	0.98	
Selvern	86	27	58.1	0.83	
Smiths Mills	.....	.....	.....	1.14	
Society Hill	82	31	58.8	2.13	
Spartanburg	83	21	55.6	1.52	T.
Statesburg	85	35	60.6	1.44	
Summerville	87	33	59.9	0.87	
Trenton	84[d]	37[d]	68.1[d]	0.83	
Trial	85	29	59.8	0.90	
Walhalla	80	25	55.4	1.70	T.
Walterboro	89	33	60.8	0.94	
Winnsboro	84	35	60.6	2.05	
Winthrop College	83	30	57.5	1.04	
Yemassee	88	36	61.5	0.93	
Yorkville	86	32	58.4	1.31	
South Dakota.					
Aberdeen	78	15	40.9	6.80	17.5
Academy	81	11	44.4	2.66	11.0
Alexandria	80	13	42.6	2.75	3.0
Armour	87	18	45.6	2.80	10.0
Ashcroft	80	16	43.0	0.44	3.0
Bowdle	80	11	41.6	2.03	8.0
Brookings	77	12	40.8	1.78	
Canton	78	16	43.0	2.03	4.0
Cavite	83	8	45.8	0.30	3.0
Centerville	.....	.....	.....	2.88	3.0
Chamberlain	83	4	45.2	1.18	0.5
Cherrycreek	88	15	46.7	0.10	.....
Clark	81	12	40.5	2.00	5.0
Clear Lake	73	16	39.1	3.28	0.8
Desmet	78	11	41.4	1.86	5.5
Doland	80	8	39.5	1.87	11.0
Elkpoint	78	12	45.4	4.29	.....
Fairfax	80	12	45.0	1.60	.....
Farmingdale	.....	.....	.....	0.34	3.0
Faulkton	83	9	41.1	2.00	9.0
Flandreau	79	14	41.6	2.21	T.
Forestburg	85	10	41.4	2.79	10.0
Fort Meade	81	15	45.8	0.96	.....
Gannvalley	81	12	44.1	2.83	1.0
Grand River School	85	9	44.6	0.52	T.
Greenwood	79	13	45.4	1.79	2.0
Highmore	82	10	43.2	1.43	3.2
Hotch City	82	7	44.0	0.66	2.0
Howard	76[d]	12[d]	41.0[d]	1.93	0.8
Howell	82	7	41.0	1.60	3.4
Ipswich	81	11	40.4	4.57	10.0
Kidder	79	14	38.5	2.65	4.0
Kimball	81	11	43.0	1.51	4.0
Leola	79	12	38.5	3.40	6.0
Marion	78[e]	21[e]	43.6[e]	2.91	.....
Menno	80	12	43.1	2.19	7.5
Millbank	77	18	40.3	2.25	T.
Mitchell	82	11	42.7	2.47	7.5
Oelrichs	83	15	46.6	0.41	2.0
Pedro	86[f]	15[f]	46.8[f]	.....	.....
Pine Ridge	81[e]	11[e]	48.0[e]	0.20[e]	.....
Plankinton	80	10	42.4	2.65	12.0
Ramsey	76	12	41.6	2.85	4.0
Redfield	80	9	39.8	2.70	15.0
Rosebud	83	10	47.5	0.60	T.
Silver City	.....	.....	.....	0.41	.....
Sioux Falls	80	13	41.8	2.87	2.0
Sisseton Agency	74	13	38.0	2.99	7.3
Spearfish	83	19	45.3	1.04	.....
Stephan	84	10	42.2	1.37	2.5
Tyndall	80	20	44.4	3.32	.....
Vermillion	78[d]	21[d]	44.9[d]	2.95	0.5
Watertown	78	13	40.1	0.93	0.2
Wentworth	79	12	41.2	2.38	2.4
Wolsey	.....	.....	.....	2.95	14.0
Tennessee.					
Andersonville	77	18	48.4	2.22	3.0
Arlington	78	31	53.9	3.14	
Ashwood	78	30	54.2	3.38	
Bluff City	.....	.....	.....	2.48	
Bolivar	78	32	53.8	3.50	
Bristol	75	23	49.4	2.47	T.
Brownsville	78	35	55.2	4.78	
Byrdstown	80	26	51.9	2.64	3.0
Carthage	.....	33	.....	3.03	
Catlettsburg	.....	.....	.....	3.13	
Cedar Hill	82	28	53.2	4.55	
Celina	.....	.....	.....	1.86	2.5
Charleston	.....	.....	.....	1.60	
Clarksville	80	30	53.7	2.30	
Clinton	.....	.....	.....	2.38	2.0
Covington	78	35	54.8	6.36	
Decatur	79	27	54.6	2.07	
Dickson	80	28	53.6	3.80	
Dover	84	27	54.4	2.60	
Dyersburg	78	33	52.2	3.75	
Elizabethton	75	26	51.7	2.64	0.2
Erasmus	76	22	49.8	3.86	T.
Florence	79	29	54.4	2.91	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Franklin	80	30	54.0	5.53	
Grace	.....	.....	.....	2.60	
Greeneville	78	21	51.6	3.08	4.5
Halls Hill	.....	.....	.....	3.47	
Harriman	77	30	53.6	2.64	T.
Hohenwald	80	21	52.6	4.30	
Iron City	80	28	55.7	3.21	
Isabella	75	26	52.6	2.64	T.
Jackson	80	28	54.8	4.43	
Johnsonville	82	27	54.9	4.20	
Jonesboro	78	25	50.8	3.59	2.9
Kenton	80	29	53.8	4.03	
Kingston	.....	.....	.....	2.28	
Lafayette	79	26	52.5	2.62	
Leadvale	.....	.....	.....	1.70	0.4
Lebanon	.....	.....	.....	2.46	
Lewisburg	80	29	55.8	2.73	T.
Lynnville	78	30	54.7	2.23	T.
McMinnville	83	25	53.6	3.30	0.3
Maryville	78	29	53.8	2.77	T.
Milan	80	30	53.0	5.07	
Monterey	75	25	50.6	3.57	1.1
Newport	80	25	52.5	2.70	2.0
Palmetto	80	28	55.2	2.72	
Pope	83	28	56.3	4.40	
Rogersville	77	21	51.8	3.21	2.0
Rugby	79	20	49.6	3.65	3.5
Savannah	82	31	56.2	3.82	
Sewanee	76	26	51.4	2.31	
Silverlake	75	18	47.6	3.02	2.8
Springdale	80	17	50.2	2.83	5.5
Springville	81	27	54.4	3.22	
Tazewell	.....	.....	.....	2.55	3.5
Tellico Plains	80	27	55.6	1.89	
Tracy City	75	27	50.8	2.90	T.
Trenton	80	29	57.4	5.17	
Tullahoma	81	27	53.8	3.47	T.
Waynesboro	79	28	55.1	3.84	
Wildersville	77	33	55.3	3.75	
Yukon	80	29	55.7	3.23	
Texas.					
Albany	95	37	65.2	2.17	
Alvin	86	43	69.4	3.14	
Arthur	.....	.....	.....	3.87	
Athens	94	33	65.1	.....	
Austin *a*	91	35	67.6	6.08	
Ballinger	95	36	64.8	1.51	
Beaumont	88	55	73.1	3.40	
Bigspring	97[c]	39	65.0[d]	1.12	
Blanco	93	33	63.8	2.70	
Boerne	91	39	66.0	4.26	
Bonham	86	37	63.6	3.78	
Booth	.....	.....	.....	3.31	
Bowie	92	39	63.8	2.57	
Brazoria	83	35	68.9	2.90	
Brenham	86	43	67.5	8.09	
Brighton	83	42	72.4	1.44	
Brownwood	95	40	67.2	0.80	
Burnet	90	32	66.2	2.87	
Childress	98	36	62.7	1.49	
Claytonville	97	35	65.6	1.24	
Coleman	93	42	66.0	2.95	
College Station	88	39	67.2	3.63	
Colorado	99	34	66.2	1.42	
Columbia	85	38	68.2	3.47	
Columbus	.....	.....	.....	3.75	
Comanche	96	34	65.8	2.45	
Comstock	102	48	71.5	3.14	
Corsicana	95	39	65.0	3.83	
Cotullo	98	57	73.4	2.52	
Cuero	90	41	72.2	2.95	
Dallas	92	36	62.8	4.75	
Danevang	89	40	70.0	3.44	
Dialville	84	38	63.6	4.47	
Dublin	92	.....	.....	2.00	
Duval	91	44	68.6	4.96	
Eastland	95	34	65.8	2.00	
Estelle	94	37	64.6	4.59	
Fort Brown	89	51	76.2	2.78	
Fort Clark	98	45	71.0	3.05	
Fort Davis	89	33	61.7	0.00	
Fort McIntosh	100	48	77.2	2.66	
Fort Ringgold	99	48	79.8	0.57	
Fort Stockton	.....	.....	.....	0.51	
Fredericksburg	91[d]	39[d]	66.4[d]	2.55	
Gainesville	86	33	61.4	3.26	
Gatesville	102	36	68.6	2.68	
Georgetown	94	37	66.3	2.00	
Graham	98[d]	33[d]	66.4[d]	0.63	
Grapevine	93	39	64.8	3.94	
Greenville	89	36	63.1	5.66	
Hale Center	90	34	59.6	0.14	
Hallettsville	90	36	70.6	0.98	
Haskell	101	36	65.8	1.15	
Hearne	93	.....	.....	4.34	
Hempstead	.....	.....	.....	3.45	
Henrietta	96	38	64.4	2.57	
Hewitt	.....	.....	.....	3.35	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Hillsboro	92	35	64.6	2.65	
Hondo	92	44	69.0	4.92	
Houston	87	41	68.8	4.83	
Huntsville	88	56	66.2	2.30	
Ira	98	35	63.8	2.00	
Jasper	86	36	64.6	4.32	
Jefferson	83	35	62.8	4.98	
Jewett	87	33	64.5	6.05	
Junction	.....	.....	.....	1.65	
Kaufman	89	39	65.4	3.41	
Kent	94	35	64.0	0.01	
Kerrville	91	42	70.8	1.85	
Knickerbocker	98	36	66.8	2.43	
Kopperl	.....	.....	.....	3.10	
Lampasas	92	34	64.5	4.19	
Lapara	.....	.....	.....	0.81	
Laureles Ranch	.....	.....	.....	2.58	
Liberty	.....	.....	.....	5.70	
Llano	94	51	67.4	3.45	
Longview	86	38	63.4	6.23	
Luling	93	36	67.5	2.42	
McKinney	90	45	67.6	5.56	
Mann	92	35	66.0	2.99	
Marlin	89	39	64.2	4.24	
Menardville	92[d]	29[d]	62.0[d]	0.52	
Mount Blanco	95	31	59.9	0.02	
Nacogdoches	85	34	63.1	4.41	
New Braunfels	91	39	68.6	2.99	
Orange	.....	.....	.....	2.60	
Panter	.....	.....	.....	2.84	
Paris	89	34	62.0	2.45	
Pearsall	96	45	72.6	2.45	
Pecos	93	40	68.0	0.00	
Port Lavaca	82	46	70.4	4.76	
Rhineland	97	32	61.3	0.00	
Riverside	.....	.....	.....	4.65	
Rockisland	87	38	68.8	2.89	
Rockland	.....	.....	.....	5.01	
Rockport	76	58	67.0	1.88	
Runge	95[f]	40[f]	71.4[f]	.....	
Sabinal	96	38	69.6	2.88	
San Marcos	91	36	67.2	1.64	
San Saba	95	31	66.6	1.46	
Santa Gertrudes Ranch	.....	.....	.....	1.50	
Sherman	91	43	65.5	1.75	
Sonora	101	30	67.0	0.93	
Sugarland	83	38	66.2	3.54	
Sulphur Springs	85	40	62.5	4.59	
Temple *a*	86	40	62.2	4.21	
Temple *b*	86	40	62.8	4.21	
Tilden	98	35	71.0	1.20	
Trinity	88	34	66.5	5.14	
Tulia[d]	93	28	56.1	0.95	
Tyler	88	40	62.6	3.17	
Vernon	97	.....	.....	0.05	
Victoria	87	41	70.6	3.33	
Waco	92	44	66.4	4.97	
Waxahachie	92	40	63.0	4.42	
Weatherford	93	40	63.6	2.13	
Wichita Falls	.....	.....	.....	3.35	
Utah.					
Alpine	.....	.....	.....	3.02	
Aneth	85	25	55.0	0.03	
Blackrock	83	20	47.8	0.26	2.0
Bluecreek	.....	.....	.....	0.30	
Callao	84	20	47.7	0.28	2.0
Cisco	85	25	54.9	0.18	
Corinne	86	26	51.0	0.59	2.0
Coyoto	72	14	42.0	0.50	5.0
Deseret	84	19	48.1	0.13	3.0
Emery	66	15	42.4	T.	
Escalante	82	21	48.4	0.54	
Experiment Farm	91	27	58.1	.....	
Farmington	76	26	48.6	2.82	9.0
Fillmore	86	23	50.8	0.26	
Fort Duchesne	84	22	52.0	0.25	0.5
Frisco	78	21	48.2	0.10	T.
Garrison	82	18	48.6	0.06	0.6
Giles	79	25	49.2	0.23	
Government Creek	79	21	47.0	0.79	1.5
Grover	75	20	45.7	1.65	12.0
Heber	78	18	45.1	0.96	7.0
Henefer	77	19	44.6	0.95	T.
Hite	94	33	60.4	T.	
Huntsville	.....	.....	.....	1.74	2.0
Ibapah	80	14	43.8	1.05	8.5
Kanab	83	14	46.6	0.10	
Levan	77	23	46.4	1.00	6.9
Loa	76	10	43.2	1.00	10.0
Logan	90	27[e]	49.0[e]	1.61	
Lund	87[d]	24[d]	48.6[d]	0.12	2.0
Manti	78	23	45.8	0.93	.....
Marysvale	79	20	46.0	0.37	3.8
Meadowville	69	19	40.7	1.30	5.0
Millville	.....	.....	.....	1.88	
Moab	90	28	57.2	0.08	
Monticello	80	30	56.1	0.12	
Morgan	77	18	45.0	0.91	.....

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mount Nebo	80	24	49.1	0.33	.....
Mount Pleasant	78	15	47.1	1.12	
Ogden	79	27	51.6	2.34	.....
Park City	80	14	45.2	1.69	16.9
Parowan	78	21	47.3	1.27	12.7
Pinto	77	16	43.2	0.44	1.9
Plateau	75	16	42.0	0.79	8.6
Promontory *1	78	30	45.9	0.00	
Provo	89	24	50.0	1.56	8.0
Ranch	75	15	42.6	0.44	
Richfield	84	23	47.7	0.07	
Rockville	92	26	59.0	0.19	
St. George	91	22	54.6	0.02	
Salt Air	75	30	49.6	1.92	
Scipio	81	18	48.1	0.27	1.0
Snowville	79	19	46.2	1.38	
Soldier Summit	86	11	39.6	0.60	6.0
Terrace	82	24	51.2	0.20	1.0
Thistle	87	23	50.0	0.90	
Tooele	79	25	49.1	2.05	
Tropic	77	14	45.0	T.	
Woodruff	75	20	43.4	0.58	T.
Vermont.					
Burlington	65	22	43.3	3.06	10.0
Cavendish	69	14	40.1	5.65	14.7
Chelsea	60	12	36.7	2.82	17.0
Chittenden	.....	.....	.....	3.94	.....
Cornwall	69	18	42.0	3.65	19.0
Derby	59	20	38.4	3.49	10.0
Enosburg Falls	69	12	41.3	2.43	7.0
Jacksonville	62	10	35.2	5.29	16.0
Manchester	65	18	39.9	2.72	5.0
Morrisville	69	9	40.2	3.00	14.5
Norwich	66	13	39.4	5.04	17.0
St. Johnsbury	67	11	40.8	2.67	11.0
Wells	64	16	38.9	3.47	12.0
Woodstock	62	13	38.8	5.92	19.0
Virginia.					
Ashland	83	24	52.3	2.93	
Barboursville	78	23	51.2	1.98	T.
Bigstone Gap	76	26	51.1	2.98	T.
Blacksburg	78	17	46.6	2.19	T.
Burkes Garden	71	14	44.1	3.76	T.
Callaville	83	27	55.6	2.05	
Charlottesville	82	26	82.8	2.70	
Clarksville	.....	.....	.....	1.50	
Columbia	78	22	51.8	2.70	
Dale Enterprise	78	18	48.0	2.44	1.0
Danville	85	30	56.4	0.97	
Elk Knob	72	23	48.0	3.02	0.5
Farmville	85	24	52.8	1.20	
Fredericksburg	81	25	51.6	2.50	
Hampton	79	31	55.0	1.36	
Hot Springs	75	11	45.1	4.95	
Lexington	83	20	50.5	2.11	
Lincoln	.....	.....	.....	2.52	
Marion	.....	.....	.....	4.00	
McDowell	90	16	49.0	2.37	
Mendota	.....	.....	.....	3.29	T.
Mount Weather	74	20	43.6	3.80	T.
Newport News	90	30	60.2	2.91	
Petersburg	83	28	54.7	1.61	
Quantico	86	25	52.3	.....	
Radford	.....	.....	.....	1.06	
Riverton	.....	.....	.....	2.82	
Roanoke	.....	23	.....	2.36	
Rockymount	77	21	47.4	1.76	
Saxe	85	21	53.8	1.41	
Shenandoah	.....	.....	.....	2.64	
Speers Ferry	.....	.....	.....	2.98	
Spottsville	82	26	53.8	1.59	
Stanardsville	77	22	48.7	3.15	
Staunton	79	20	50.0	2.61	T.
Stephens City	81	25	49.0	3.27	T.
Warsaw	82	26	52.4	4.03	
Wilkerson	80	27	51.8	3.26	
Williamsburg	78[2]	29[2]	53.2[2]	1.93	
Woodstock	80	22	49.4	2.58	T.
Wytheville	78	20	47.8	2.13	T.
Washington.					
Aberdeen	88	30	51.6	4.56	
Anacortes	.....	.....	.....	1.38	
Ashford	.....	.....	.....	6.04	2.0
Bellingham	72	30	49.4	1.84	
Blaine	69	31	49.4	1.87	
Brinnon	74	32	50.4	4.98	
Cedonia	79	27	51.2	2.24	
Centralia	92	30	52.8	2.67	
Cheney	82	20	48.6	0.70	
Clearbrook	83	27	52.0	3.57	
Clearwater	87	29	51.1	6.60	
Cle Elum	78	21	45.6	1.45	
Colfax	83	25	49.4	1.34	
Colville	85	22	48.8	2.00	
Conconully	80	24	46.2	1.23	
Coupeville	72	34	51.8	1.47	
Crescent	78	26	47.7	1.73	
Cusick	79	17	46.8	1.90	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Danville	81	24	48.9	1.70	
Dayton	83	31	53.8	2.16	
East Sound[e]	71	29	50.4	1.37	
Ellensburg	80	21	49.8	0.73	
Ephrata	82	30	54.2	0.50	
Grandmound	87[a]	27[b]	51.6[b]	3.01	
Granite Falls	....	.....	.....	6.08	
Horseheaven	.....	.....	.....	0.89	
Kennewick	89	21	56.8	0.35	
Lacenter	89	29	52.2	4.24	
Lakeside	80	32	50.8	1.05	
Lester	85	29	48.6	2.85	
Lind	83	20	51.2	1.35	
Loomis	82	28	52.0	2.50	
Mottinger Ranch	87	33	59.0	1.20	
Mount Pleasant	83	33	52.8	4.29	
Moxee	84	23	53.0	0.65	
Northport	78	19	46.6	1.71	
Olga	68	33	50.1	1.46	
Olympia	90	30	52.1	3.64	
Pinehill	82	29	52.7	1.40	
Port Townsend	72	36	51.0	1.83	
Pullman	82	28	50.2	1.34	
Rattlesnake	76	28	48.2	0.26	0.5
Republic	80	19	46.0	1.64	
Ritzville	.....	.....	.....	0.35	
Ritzville (near)	.....	.....	.....	1.10	
Rosalia	79	28	49.6	1.63	
Sedro-Woolley	77	32	52.3	3.19	
Snohomish	79	30	51.6	4.53	
Snoqualmie	85	30	50.6	4.05	
Southbend	84	30	51.6	4.17	
South Ellensburg	80	22	49.9	0.09	
Sprague	.....	.....	.....	0.75	
Sunnyside	82	27	53.6	0.23	
Trinidad	83	32	55.4	1.00	
Twisp	83	17	46.1	1.89	
Union	77[d]	30[d]	49.8[d]	3.72	
Vancouver	89	31	53.9	2.44	
Vashon	73	34	51.4	3.29	
Waterville	74	20	44.1	1.11	
Wenatchee (near)	76	27	49.2	1.57	T.
Wilbur	80	26	50.4	1.25	
Zindel	84	33	56.4	1.02	
West Virginia.					
Bayard	75	16	42.5	3.18	1.0
Beckley	76	18	47.3	1.93	
Bens Run	75	22	47.6	3.70	2.0
Berkeley Springs	77	23	48.0	2.22	
Beverly	78	16	45.6	3.87	6.0
Bluefield	76	20	53.4	0.42	
Buckhannon	78	19	47.8	3.23	3.0
Burlington	77	17	46.8	1.45	1.0
Cairo	78	15	48.4	3.31	1.0
Central	78	17	47.4	2.56	2.0
Chapel	76	20	46.4	5.86	
Charleston	78	26	51.6	4.08	0.2
Creston	84	20	48.4	2.39	
Cuba	76	19	48.2	3.16	1.0
Elkhorn	75	22	49.8	3.85	
Fairmont	.....	.....	.....	3.14	0.5
Grafton	77	19	47.8	3.77	3.0
Harpers Ferry	.....	.....	.....	2.25	
Hinton	.....	.....	.....	2.46	T.
Huntington	77	24	48.6	4.36	0.5
Leonard	82	17	43.8	3.17	
Lewisburg	77	19	47.1	2.62	T.
Lillydale	78	19	48.6	2.75	T.
Logan	81	25	53.6	5.20	
Lost Creek	76	17	42.9	4.39	2.0
Marlinton	75[d]	16[d]	44.0[d]	1.12	T.
Mannington	78	19	48.0	3.29	1.0
Martinsburg	80	25	47.0	2.58	
Moorefield	82	16	50.0	3.40	4.0
Morgantown	76	19	47.6	2.86	1.0
Moundsville	76	20	47.9	2.30	T.
New Cumberland	72	17	44.7	2.43	T.
New Martinsville	78[f]	23[f]	50.6[f]	2.67[f]	0.5
Nuttallburg	82	20	56.8	1.80	T.
Parsons	79	15	45.7	3.44	0.5
Philippi	80	18	47.0	2.37	2.0
Pickens	77	15	45.0	5.52	7.0
Point Pleasant	75	24	50.8	2.64	T.
Powellton	81	12	47.0	5.71	
Princeton	78	23	48.0	4.55	2.0
Romney	74	20	46.9	1.65	1.0
Rowlesburg	.....	.....	.....	3.58	2.0
Ryan	78	20	49.6	3.43	2.0
Southside	76	20	51.2	3.18	0.5
Spencer	78	19	48.2	2.34	T.
Terra Alta	75	12	44.2	4.14	8.0
Uppertract	79	16	47.3	2.31	0.5
Valley Fork	82	21	49.6	4.40	T.
Wellsburg	75	13	44.2	2.91	4.5
Weston	.....	.....	.....	4.43	2.5
Wheeling *a*	.....	.....	.....	1.57	0.5
Wheeling *b*	77	27	51.6	2.63	0.5
Williamson	80	24	52.0	2.98	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Wisconsin.	°	°	°	*Ins.*	*Ins.*
Amherst	75	5	38.8	2.65	8.0
Antigo	.....	4	.....	2.30	17.0
Appleton	75	15	39.8	2.42	13.6
Appleton Marsh	76	12	39.6	2.09	4.4
Ashland	.....	.....	.....	0.97	T.
Barron	78	10	39.3	2.20	17.5
Beloit	78	21	44.1	1.89	.....
Brodhead	83	19	43.2	2.03	.....
Burnett	78	11	40.0	1.52	3.0
Butternut	73	— 5	33.3	1.29	11.2
Chilton	76	12	39.5	2.66	13.2
Chippewa Falls	.....	.....	.....	0.40	.....
Citypoint	74	16	40.4	2.18	3.0
Darlington	78	9	39.8	1.65	0.5
Dodgeville	77	18	42.8	.....	0.5
Downing	75	5	38.8	2.00	12.0
Durand	.....	.....	.....	1.20	1.0
Easton	78	5	39.8	1.83	3.5
Eau Claire	79	13	42.2	1.31	8.8
Florence	70	9	33.4	0.62	2.0
Fond du Lac	80	3	40.2	1.78	4.0
Grand Rapids	73	12	38.6	1.32	4.0
Grand River Locks	.....	.....	.....	2.12	6.0
Grantsburg	75	7	38.8	1.25	12.0
Hancock	73	7	38.8	1.45	4.0
Harvey	79	18	40.8	1.80	2.6
Hayward	72	— 6	35.4	2.67	18.5
Hillsboro	74	8	39.6	1.74	2.5
Koepenick	78	3	35.6	2.90	19.0
Lancaster	77	18	41.9	2.25	1.5
Madison	74	20	40.2	1.39	0.5
Manitowoc	64	14	38.2	2.01	8.5
Meadow Valley	75	10	39.8	1.69	5.8
Medford	73	4	37.6	3.05	16.0
Menasha	.....	.....	.....	1.64	8.0
Minocqua	73	— 2	34.0	1.05	9.0
Mount Horeb	65	13	37.2	1.98	2.0
Neillsville	78	10	40.2	2.22	8.0
New London	75	13	38.5	2.49	12.0
Oconto	72	11	38.8	2.40	10.0
Osceola	77	7	39.6	1.52	9.0
Oshkosh	75	14	38.9	1.51	10.0
Pine River	76	11	39.3	2.06	8.8
Portage	79	15	42.3	2.13	4.0
Port Washington	64	9	36.4	2.60	8.0
Prairie du Chien *a*	79	20	44.5	2.38	0.5
Prairie du Chien *b*	.....	.....	.....	2.16	0.5
Prentice	72	9	36.0	1.69	15.0
Racine	67	20	40.4	1.71	.....
Sheboygan	64	15	39.0	2.37	11.0
Spooner	74	0	37.3	1.07	10.7
Stanley	75	7	39.3	2.09	9.5
Stevens Point	78	16	40.0	1.72	6.0
Valley Junction	80	16	41.8	1.29	0.5
Viroqua	74	19	41.0	1.91	1.5
Washburn	65	13	35.6	1.39	9.2
Watertown	78	16	40.4	1.53	2.5
Waukesha	80	17	39.4	1.97	3.0
Waupaca	74	14	38.5	1.84	10.0
Wausau	75	4	37.6	2.42	.....
Whitehall	76	11	40.5	1.66	3.0
Wyoming.					
Afton	69	4	36.0	1.92	9.0
Alcova	77	18	45.8	0.47	3.4
Basin	79	21	51.0	1.46	.....
Battle	53	5	30.0	3.00	30.0
Bedford	64	2	34.0	1.26	2.9
Border	70	5	35.0	0.77	7.6
Buffalo	70	16	44.2	0.46	1.0
Chugwater	76	9	44.6	1.70	.....
Daniel	64	— 2	32.2	0.30	3.0
Embar	80	16	47.6	1.30	.....
Evanston	70	18	39.8	1.13	3.0
Fontenelle	68	14	40.5	0.05	0.5
Fort Laramie	82	18	45.7	1.06	1.5
Fort Washakie	79	11	45.6	1.50	T.
Fourbear	72	5	39.8	1.01	12.5
Griggs	76	18	44.6	1.45	5.0
Hot Springs	74	20	51.2	8.27	T.
Hyattville	85	17	48.2	.....	.....
Kimball Ranch	73[d]	16[d]	46.4[d]	1.55	2.0
Laramie	69	13	39.1	0.84	10.7
Leo	72	10	40.2	0.73	8.5
Lolabama Ranch	67	4	38.0	0.93	8.0
Lusk	84	13	44.4	1.22	2.5
Marquette	75	15	45.4	0.71	2.0
Moore	74	17	42.7	1.97	.....
Moorcroft	75	18	44.5	1.95	.....
Phillips	78	15	45.5	1.12	0.5
Pine Bluff	79	12	44.0	0.89	T.
Rawlins	78	12	43.5	0.52	5.2
Red Bank	78	21	47.6	3.40	.....
Rock Springs	75	1	45.7	0.55	T.
South Pass	64	— 3	34.9	1.20	12.0
Tensleep	79	18	47.7	1.81	8.0
Wells	54	— 4	30.0	0.84	7.0
Yellowstone Pk. (G.Can.)	62	—12	30.8	0.61	.....
Yellowstone Pk. (Lake)	70	— 5	33.8	0.94	7.0

TABLE II.—*Climatological record of voluntary and other cooperating observers. Late reports for March*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Wyoming—Cont'd.					
Yellowstone Pk. (L. Basin)	66	3	33.6	0.90	.....
Yellowstone Park (Norris)	67	— 8	33.4	2.53	21.5
Porto Rico.					
Aguirre	90	67	77.4	1.31	
Arecibo	88	55	70.9	4.30	
Barros	84	54	69.8	3.68	
Bayamon	91	60	76.3	2.10	
Caguas	87	54	73.7	5.23	
Canovanas	88	68	77.6	3.80	
Cayey	85	54	71.8	3.15	
Cidra	88	50	69.9	9.38	
Coamo	89	51	71.6	4.50	
Fajardo	89	65	77.3	4.57	
Guanica	87	60	74.0	2.05	
Hacienda Colosa	88	60	74.8	3.95	
Hacienda Josefa	....	.....	.....	2.54	
Hacienda Perla	88	64	76.6	11.35	
Humacao	87	71	78.4	7.06	
Isabela	85	62	74.1	3.21	
Juan Diaz	90	61	75.1	2.30	
La Carmelita	82	59	71.0	7.12	
La Isolina	88	59	72.4	8.06	
Lares	90	54	72.0	7.39	
Las Marias	88	61	74.5	10.90	
Manati	94	60	76.0	3.06	
Maunabo	92	65	78.0	5.91	
Mayaguez	89	61	75.2	8.95	
Morovis	89	57	73.7	5.46	
Rio Blanco	87	63	76.0	6.36	
Rio Piedras	.....	.....	.....	4.03	
San German	93	62	77.2	9.30	
San Lorenzo	90	58	74.8	5.40	
San Salvador	85	60	71.6	5.06	
Santa Isabel	87	62	75.6	1.44	
Vieques	88	60	73.9	3.80	
Yauco	85	64	75.6	2.61	
Mexico.					
Contzacoalcos	98	66	77.4	2.24	
Leon de Aldamas	90	49	69.0	0.46	
Vera Cruz	90	68	79.0	0.58	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
New Brunswick.					
St. John	58	18	37.4	3.45	7.6
Isthmus of Panama.					
Alhajuela	93	70	80.8	6.97	
Bohio	.....	.....	.....	13.70	
Colon	.....	.....	.....	11.46	
Gamboa	.....	.....	.....	12.01	
La Boca	86	72	78.7	7.76	

Late reports for March, 1904.

Alaska.					
Coal Harbor	48	7	30.0	0.32	2.2
Copper Center	47	—42	3.6	T.	0.2
Fort Liscum	49	5	24.8	0.10	1.5
Killisnoo	46	13	27.6	1.20	10.5
Loring	54	—10	26.8	1.60	15.5
Mine Harbor	44	4	24.0	0.29	5.0
Orca	52	11	30.2	0.72	11.0
Skagway	52	2	22.8	0.33	4.0
Sunrise	42	—11	16.4	0.28	5.5
Teikhill	46	—24	18.6	0.05	0.5
Wood Island	47	11	28.4	T.	T.
Arizona.					
San Simon	84	22	58.7	0.00	
Florida.					
Micanopy	94	42	67.3	1.00	
New Mexico.					
Albuquerque	76	.....	.....	T.	
North Carolina.					
Mount Airy	76	23	45.8	3.56	T.
Ohio.					
Rittman	71	18	39.6	2.58	.....
Oklahoma.					
Pawhuska	88	14	52.7	2.45	
Texas.					
Jefferson	.....	.....	.....	3.07	
Vermont.					
Chittenden	.....	.....	.....	2.31	.....
Porto Rico.					
La Carmelita	84	58	70.2	16.89	

EXPLANATION OF SIGNS.

•Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. + 4.
[2] Mean of 8 a. m. + 8 p. m. + 2.
[3] Mean of 7 a. m. + 7 p. m. + 2.
[4] Mean of 6 a. m. + 6 p. m. + 2.
[5] Mean of 7 a. m. + 2 p. m. + 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "ª" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

February, 1904, Georgia, Diamond, make minimum and mean temperatures read 13 and 43.4 instead of 5 and 39.4; March, 1904, make minimum and mean temperatures read 29 and 53.6 instead of 12 and 49.9.

March, 1904, Colorado, Durango, make snowfall 13.0 instead of 11.0 inches. Indiana, Markle, make precipitation 6.10 instead of 6.60. Iowa, Earlham, make precipitation 1.69 instead of 1.19. Kansas, Republic, make precipitation 0.49 instead of 1.39. Mississippi, Pittsboro, make precipitation 5.29 instead of 4.72. Wyoming, Phillips, make precipitation 0.41 instead of 0.95. Wyoming, Leo, make mean temperature 31.7 instead of 31.8.

Page 134, column 1, line 5 from top, make "below" read "above."

NOTE.—The following change has been made in the names of stations: Washington, Usk changed to Cusick.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of April, 1904.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	13	24	16	20	s. 20 w.	12
Portland, Me	20	20	12	24	w.	12
Concord, N. H.†	11	5	10	10	n.	6
Northfield, Vt	22	28	6	13	s. 49 w.	9
Boston, Mass	16	14	11	29	n. 84 w.	18
Nantucket, Mass	11	29	13	21	s. 24 w.	20
Block Island, R. I	15	21	13	23	s. 59 w.	12
Narragansett, R. I.*	5	16	11	10	s. 5 e.	11
New Haven, Conn	22	18	16	19	n. 37 w.	5
Middle Atlantic States.						
Albany, N. Y	24	22	6	19	n. 81 w.	13
Binghamton, N. Y.†	10	3	10	15	n. 36 w.	9
New York, N. Y	20	18	15	23	n. 76 w.	8
Harrisburg, Pa	20	16	15	24	n. 66 w.	10
Philadelphia, Pa	23	15	14	23	n. 48 w.	12
Scranton, Pa	17	16	11	28	n. 87 w.	17
Atlantic City, N. J	21	19	11	24	n. 81 w.	13
Cape May, N. J	14	19	13	24	s. 66 w.	12
Baltimore, Md	21	18	13	24	n. 75 w.	11
Washington, D. C	26	10	16	26	n. 32 w.	19
Cape Henry, Va.†	8	13	10	6	s. 39 e.	6
Lynchburg, Va	15	19	12	29	s. 77 w.	18
Norfolk, Va	19	27	11	13	s. 14 w.	8
Richmond, Va	20	21	12	21	s. 84 w.	9
Wytheville, Va	9	15	10	35	s. 77 w.	26
South Atlantic States.						
Asheville, N. C	25	21	15	19	n. 45 w.	6
Charlotte, N. C	13	22	15	23	s. 42 w.	12
Hatteras, N. C	20	19	14	23	n. 84 w.	9
Kittyhawk, N. C.*						
Raleigh, N. C	20	19	9	29	n. 87 w.	20
Wilmington, N. C	17	20	12	25	s. 77 w.	13
Charleston, S. C	14	22	14	26	s. 56 w.	14
Columbia, S. C	14	17	16	24	s. 69 w.	8
Augusta, Ga	15	17	14	27	s. 81 w.	13
Savannah, Ga	14	20	12	28	s. 69 w.	17
Jacksonville, Fla	20	21	17	16	s. 45 e.	1
Florida Peninsula.						
Jupiter, Fla	11	19	20	22	s. 14 w.	8
Key West, Fla	28	1	32	5	n. 57 e.	32
Sand Key, Fla.†	15	5	16	2	n. 54 e.	17
Tampa, Fla	23	6	18	25	n. 22 w.	18
Eastern Gulf States.						
Atlanta, Ga	18	17	12	28	n. 87 w.	16
Macon, Ga.†	9	11	5	13	s. 76 w.	8
Pensacola, Fla.†	15	6	6	10	n. 24 w.	10
Birmingham, Ala.†	9	9	9	11	w.	2
Mobile, Ala	22	25	8	16	s. 69 w.	8
Montgomery, Ala	14	23	16	22	s. 34 w.	11
Meridian, Miss.†	11	8	6	12	n. 63 w.	7
Vicksburg, Miss	19	21	15	14	s. 27 e.	2
New Orleans, La	21	27	16	11	s. 40 e.	8
Western Gulf States.						
Shreveport, La	15	23	23	13	s. 51 e.	13
Fort Smith, Ark	21	8	28	12	n. 51 e.	21
Little Rock, Ark	24	17	19	16	n. 23 e.	8
Corpus Christi, Tex	12	28	36	1	s. 65 e.	38
Fort Worth, Tex	19	25	21	9	s. 63 e.	13
Galveston, Tex	12	33	22	7	s. 35 e.	26
Palestine, Tex	23	23	19	8	e.	11
San Antonio, Tex	21	21	30	6	e.	24
Taylor, Tex.†	10	13	11	4	s. 67 e.	8
Ohio Valley and Tennessee.						
Chattanooga, Tenn	20	20	12	23	w.	11
Knoxville, Tenn	19	19	9	28	w.	19
Memphis, Tenn	24	18	18	16	n. 18 e.	6
Nashville, Tenn	19	18	11	23	n. 85 w.	12
Lexington, Ky.†	6	14	8	9	s. 7 w.	8
Louisville, Ky	19	19	15	22	w.	7
Evansville, Ind.†	10	7	8	10	n. 34 w.	4
Indianapolis, Ind	26	19	15	14	n. 8 e.	7
Cincinnati, Ohio	19	16	19	20	n. 18 w.	3
Columbus, Ohio	19	20	14	18	s. 76 w.	4
Pittsburg, Pa	27	14	10	24	n. 47 w.	19
Parkersburg, W. Va	20	21	12	22	s. 84 w.	10
Elkins, W. Va	23	17	3	25	n. 75 w.	23
Lower Lake Region.						
Buffalo, N. Y	13	21	14	27	s. 58 w.	15
Oswego, N. Y	15	18	13	27	s. 78 w.	14
Rochester, N. Y	15	17	12	32	s. 84 w.	20
Syracuse, N. Y	19	17	10	28	n. 84 w.	18
Erie, Pa	14	14	14	25	w.	11
Cleveland, Ohio	23	19	14	20	n. 56 w.	7
Sandusky, Ohio†	11	8	9	10	n. 18 w.	3
Toledo, Ohio	21	13	13	23	n. 51 w.	13
Detroit, Mich	25	13	12	23	n. 43 w.	16
Upper Lake Region.						
Alpena, Mich	28	8	16	19	n. 9 w.	20
Escanaba, Mich	36	10	12	13	n. 2 w.	26
Grand Rapids, Mich	21	13	17	22	n. 32 w.	9
Houghton, Mich.†	9	5	8	11	n. 37 w.	5
Marquette, Mich	35	5	5	31	n. 41 w.	40
Port Huron, Mich	24	16	12	21	n. 48 w.	12
Sault Ste. Marie, Mich	23	9	15	29	n. 45 w.	20
Chicago, Ill	24	19	17	13	n. 39 e.	6
Milwaukee, Wis	33	12	11	14	n. 8 w.	21
Green Bay, Wis	30	13	17	13	n. 13 e.	18
Duluth, Minn	36	7	24	15	n. 17 e.	30
North Dakota.						
Moorhead, Minn	26	17	24	13	n. 51 e.	14
Bismarck, N. Dak	28	17	25	7	n. 59 e.	21

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
North Dakota—Continued.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Williston, N. Dak	24	16	26	9	n. 65 e.	19
Upper Mississippi Valley.						
Minneapolis, Minn.*	12	9	8	7	n. 18 e.	3
St. Paul, Minn	26	15	17	19	n. 10 w.	11
La Crosse, Wis†	15	8	4	7	n. 23 w.	8
Davenport, Iowa	19	12	21	20	n. 8 e.	7
Des Moines, Iowa	26	17	17	17	n.	9
Dubuque, Iowa	26	12	17	22	n. 20 w.	15
Keokuk, Iowa	25	17	15	19	n. 27 w.	9
Cairo, Ill	23	21	13	16	n. 56 w.	4
Springfield, Ill	22	18	12	19	n. 60 w.	8
Hannibal, Mo.†	10	7	8	10	n. 34 w.	4
St. Louis, Mo	20	18	22	15	n. 74 e.	7
Missouri Valley.						
Columbia, Mo.*	13	6	11	9	n. 16 e.	7
Kansas City, Mo	19	16	24	17	n. 67 e.	8
Springfield, Mo	21	20	18	15	n. 72 e.	3
Topeka, Kans.*	10	8	15	5	n. 79 e.	10
Lincoln, Nebr	24	19	18	11	n. 54 e.	9
Omaha, Nebr	25	20	18	11	n. 54 e.	9
Valentine, Nebr	25	16	17	15	n. 13 e.	9
Sioux City, Iowa†	14	10	6	7	n. 14 w.	4
Pierre, S. Dak	21	16	19	19	n.	5
Huron, S. Dak	27	18	18	12	n. 34 e.	11
Yankton, S. Dak.†	8	6	7	12	n. 68 w.	5
Northern Slope.						
Havre, Mont	16	9	26	19	n. 45 e.	10
Miles City, Mont	26	10	20	18	n. 7 e.	16
Helena, Mont	7	24	3	41	s. 66 w.	42
Kalispell, Mont	10	21	13	29	s. 56 w.	19
Rapid City, S. Dak	24	14	15	24	n. 42 w.	14
Cheyenne, Wyo	25	17	10	24	n. 60 w.	16
Lander, Wyo	17	22	14	25	s. 66 w.	12
Yellowstone Park, Wyo	12	29	3	32	s. 60 w.	34
North Platte, Nebr	18	19	20	22	s. 63 w.	2
Middle Slope.						
Denver, Colo	28	14	13	14	n. 4 w.	14
Pueblo, Colo	25	14	17	16	n. 5 e.	11
Concordia, Kans	18	17	23	13	n. 84 e.	10
Dodge, Kans	20	21	20	13	s. 82 e.	7
Wichita, Kans	19	20	24	11	s. 86 e.	13
Oklahoma, Okla	20	21	24	10	s. 86 e.	14
Southern Slope.						
Abilene, Tex	23	27	19	6	s. 73 e.	14
Amarillo, Tex	16	22	22	16	s. 45 e.	8
Southern Plateau.						
El Paso, Tex	15	5	21	30	n. 42 w.	14
Santa Fe, N. Mex	14	24	20	18	s. 11 e.	10
Flagstaff, Ariz	17	20	11	30	s. 81 w.	19
Phoenix, Ariz	5	11	25	26	s. 9 w.	6
Yuma, Ariz	22	13	10	26	n. 61 w.	18
Independence, Cal	22	21	9	23	n. 86 w.	14
Middle Plateau.						
Carson City, Nev	10	20	6	34	s. 70 w.	30
Winnemucca, Nev	17	18	18	25	s. 82 w.	7
Modena, Utah	10	14	13	35	s. 80 w.	22
Salt Lake City, Utah	25	14	15	18	n. 15 w.	11
Grand Junction, Colo	21	19	14	24	n. 79 w.	10
Northern Plateau.						
Baker City, Oreg	14	31	25	12	s. 38 e.	22
Boise, Idaho	20	15	19	23	n. 39 w.	6
Lewiston, Idaho†	4	10	16	5	s. 61 e.	12
Pocatello, Idaho	5	23	24	20	s. 13 e.	18
Spokane, Wash	13	19	26	17	s. 56 e.	11
Walla Walla, Wash	13	32	14	13	s. 3 e.	19
North Pacific Coast Region.						
North Head, Wash	20	17	19	19	n.	3
Port Crescent, Wash*	12	5	7	14	n. 45 w.	10
Seattle, Wash	19	19	14	20	w.	6
Tacoma, Wash	19	20	9	23	s. 86 w	14
Tatoosh Island, Wash	8	16	28	17	s. 54 e.	14
Portland, Oreg	16	20	13	24	s. 70 w.	12
Roseburg, Oreg	26	14	15	22	n. 30 w.	14
Middle Pacific Coast Region.						
Eureka, Cal	15	25	16	20	s. 22 w.	11
Mount Tamalpais, Cal	20	18	7	30	n. 85 w.	23
Red Bluff, Cal	20	25	18	11	s. 54 e.	9
Sacramento, Cal	9	32	19	14	s. 12 e.	24
San Francisco, Cal	9	17	7	39	s. 76 w.	33
Point Reyes Light, Cal*	13	6	3	16	n. 62 w.	15
Southeast Farallon, Cal*	11	10	1	16	n. 86 w.	15
South Pacific Coast Region.						
Fresno, Cal	37	6	5	24	n. 31 w.	36
Los Angeles, Cal	15	11	19	25	n. 56 w.	7
San Diego, Cal	31	5	8	30	n. 40 w.	34
San Luis Obispo, Cal	20	15	3	28	n. 79 w.	26
West Indies						
Basseterre, St. Kitts, W. I.						
Bridgetown, Barbados						
Cienfuegos, Cuba						
Colon, Colombia, S. A.†						
Curaçoa, W. I.						
Grand Turk, W. I.†	5	3	27	0	n. 86 e.	27
Hamilton, Bermuda	19	26	9	19	s. 55 w.	12
Havana, Cuba†	5	2	24	1	n. 83 e.	23
Kingston, Jamaica						
Port of Spain, Trinidad†						
Puerto Principe, Cuba						
Roseau, Dominica, W. I.†						
San Juan, Porto Rico	5	20	47	1	s. 72 e.	48
Santiago de Cuba, Cuba						

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, April, 1904.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	60	T.	5						5	7				2			1	4				1	1				4	3						33	10	T.
		A.																																0	0	A.
Arizona	56	T.																																0	0	T.
		A.																																0	0	A.
Arkansas	57	T.	6			1	9	2	13	2	1		2	3		16	10	10	1			9	2	2	3	23	7					1		123	20	T.
		A.																																0	0	A.
California	167	T.														3	2				7	2	3					2				2		21	7	T.
		A.																																0	0	A.
Colorado	70	T.		4		3										4							3		2	4			2	4	19	4		40	11	T.
		A.																																0	0	A.
Connecticut	21	T.									6	2									1											13		22	4	T.
		A.																																0	0	A.
Delaware	5	T.								1	1																	2	2	1				7	5	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.								1																			1					2	2	T.
		A.																																0	0	A.
Florida	61	T.						2	12	16	16								7	4	3	2		1				5	1	1		4		74	13	T.
		A.																																0	0	A.
Georgia	67	T.	5					2	6	12	1			3			2	1	1	1							2	3						39	12	T.
		A.																																0	0	A.
Idaho	34	T.					1									3				4	2							1	7	1				19	7	T.
		A.																																0	0	A.
Illinois	84	T.	7							3	1						17				1			10	22	23	2							86	9	T.
		A.																																0	0	A.
Indiana	58	T.	12								2		1										1	7	4	12	24							63	8	T.
		A.																			1													1	1	A.
Indian Territory	20	T.					4		5	1							1						6	3	3	3		1				3		30	10	T.
		A.																								1								1	1	A.
Iowa	128	T.				1			2	2					1		1				1	4	18	22	42	10	8							112	12	T.
		A.																																0	0	A.
Kansas	88	T.	1			4	3	1	9	1											4	23	19	11	30	21	3				5	10		145	15	T.
		A.																																0	0	A.
Kentucky	41	T.	4	1									1	1			2							1	4	2	14	4						34	10	T.
		A.																																0	0	A.
Louisiana	46	T.	5	5	1		7	1	18	10	2						2	2					1		2	4	14					2		76	15	T.
		A.																																0	0	A.
Maine	25	T.									1	8		2																				11	3	T.
		A.																																4	3	A.
Maryland	42	T.	3		1					6	4						1		2	1							3	12	7	3	1	3		43	10	T.
		A.																																0	0	A.
Massachusetts	48	T.	1					1		1	12	6	1	1							2							2			2	15		44	11	T.
		A.																																0	0	A.
Michigan	106	T.	2							1	1													1	5	14								24	6	T.
		A.																																3	2	A.
Minnesota	67	T.							1											2			2	6	1	1		1						11	5	T.
		A.																		1														1	1	A.
Mississippi	57	T.	9	1				2	11	5				2		2	2	1	3	1	1	2	1	1	1	4	9				1			59	19	T.
		A.																																0	0	A.
Missouri	86	T.	1	2	1				5	7					3	7	11	1			7	22	12	17	47	58	28	2						231	17	T.
		A.																																0	0	A.
Montana	54	T.						1												1	8	3							3	4				20	6	T.
		A.			1															2		1												4	3	A.
Nebraska	137	T.	1	1		2		6	2	1	1		1							1	14	12	27	8	12	31	4	1		1	1	4		131	20	T.
		A.																																0	0	A.
Nevada	40	T.															2				1	2		1				1				1		8	6	T.
		A.																																0	0	A.
New Hampshire	21	T.											2																					2	1	T.
		A.			1																													1	1	A.
New Jersey	48	T.								4	11	2																7	5			6		35	6	T.
		A.																																0	0	A.
New Mexico	31	T.		1																											1			2	2	T.
		A.																																0	0	A.
New York	129	T.	2							3	31	3	2	3			1								1	2			1	1	2	11		63	13	T.
		A.																																3	3	A.
North Carolina	56	T.			1	1		1		6	1			4	1		1	3		1	2			1	1		3	15	3	4	1			49	15	T.
		A.																																0	0	A.
North Dakota	48	T.																			1	1									5	4		11	4	T.
		A.	1	1	1		1			1									3	4	2						1		1	1				17	11	A.
Ohio	101	T.	24							5	4			18	1									7	21	10	1			1			92	10	T.
		A.																																0	0	A.
Oklahoma	36	T.				4	9		4														9	6	6	4					2	5		49	9	T.
		A.																																0	0	A.
Oregon	70	T.									1	1		2	1	7	2	2	1	1	9						1	11	3			2		44	14	T.
		A.																																0	0	A.
Pennsylvania	91	T.	13		1			1		5	18	1															2	3	2	1	1	3		51	12	T.
		A.																																0	0	A.
Rhode Island	6	T.									3	3																1				3		10	4	T.
		A.																																0	0	A.
South Carolina	54	T.	3		2				9	6	2			7	1		1	8										9						48	10	T.
		A.																																0	0	A.
South Dakota	56	T.						2	1												4	4	19	6							11		47	7	T.
		A.																	1	3														4	2	A.
Tennessee	56	T.	8							1			6	4		2	10	13				4	7	2		9	19	4						89	13	T.
		A.																																0	0	A.
Texas	126	T.	15	12	5	1	21	6	14	1		1				6	17	8			1		10	20	9	10	3	1		8	14	18		201	22	T.
		A.																																0	0	A.
Utah	64	T.	1	1													1				1				1					1				6	6	T.
		A.																																0	0	A.
Vermont	12	T.																																0	0	T.
		A.																																0	0	A.
Virginia	40	T.	1							2	2	3															6	21	11					46	7	T.
		A.																																0	0	A.
Washington	71	T.						1						1	1	10	2			3	8	1	1				2		6	1				37	12	T.
		A.																																0	0	A.
West Virginia	47	T.	5						1	9	4		3	2											2		8	11				2		47	10	T.
		A.																																0	0	A.
Wisconsin	63	T.							2	14		1												2	14	7	1							41	7	T.
		A.			1																													6	3	A.
Wyoming	38	T.			1	1		2													4		1	1	6					3	1		20	9	T.
		A.																																0	0	A.
Sums	2993	T.	134	28	11	17	54	31	120	133	126	31	19	55	9	60	89	55	13	16	82	92	143	129	218	249	188	132	55	34	47	128		2,498		T.
		A.	1	1	6	1	1	0	0	1	0	0	0	0	0	0	0	0	8	16	5	0	0	0	0	1	1	0	1	1	0			44		A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during April, 1904, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total amount of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y	30			0.28														0.15			
Alpena, Mich	8			0.67														0.38			
Amarillo, Tex	4			0.17				0.17													
Asheville, N. C	8			0.27														0.19			
Atlanta, Ga	6			0.30														0.24			
Atlantic City, N. J	8			0.87														0.52			
Augusta, Ga	26			0.23									0.23								
Baltimore, Md	25			0.46														0.37			
Binghamton, N. Y	7–8			0.83														0.50			
Birmingham, Ala	26–27			0.78														0.09			
Bismarck, N. Dak	22			0.79														*			
Block Island, R. I	26–28			2.18														0.39			
Boise, Idaho	19–20			0.95														0.16			
Boston, Mass	27–28			4.12														0.37			
Buffalo, N. Y	24			0.30														0.18			
Cairo, Ill	24			1.07														0.27			
Charleston, S. C	26			0.06				0.05													
Charlotte, N. C	26			0.32														0.16			
Chattanooga, Tenn	7–8			0.35														0.28			
Chicago, Ill	23	9:25 p. m.	11:35 p. m.	0.84	10:41 p. m.	11:25 p. m.	0.08	0.14	0.21	0.38	0.50	0.56	0.59	0.62	0.66	0.74	0.76				
Cincinnati, Ohio	25			0.68														0.53			
Cleveland, Ohio	8			0.33														0.31			
Columbia, Mo	23–24	8:15 p. m.	9:50 a. m.	1.93	9:22 p. m.	9:31 p. m.	0.48	0.33	0.54	0.56											
Do	24	1:30 p. m.	11:05 p. m.	1.97	9:48 p. m.	10:37 p. m.	0.60	0.17	0.49	0.67	0.74	0.87	0.96	1.13	1.18	1.24	1.34				
Columbia, S. C	17			0.58														0.31			
Columbus, Ohio	24			0.33														0.24			
Concord, N. H	9–10			1.10														0.39			
Corpus Christi, Tex	29	10:01 a. m.	4:22 p. m.	3.88	12:31 p. m.	1:21 p. m.	0.20	0.06	0.21	0.37	0.58	0.75	0.86	0.93	1.04	1.05	1.07				
					1:21 p. m.	2:10 p. m.		1.10	1.17	1.41	1.77	2.20	2.51	2.99	3.30	3.52	3.58	3.64			
Davenport, Iowa	25			0.82														0.41			
Denver, Colo	23–24			0.60														*			
Des Moines, Iowa	23–24			1.69														0.49			
Detroit, Mich	8			0.33														0.17			
Dodge, Kans	23			0.84														0.68			
Dubuque, Iowa	22			0.49														0.25			
Duluth, Minn	11			0.15														*			
Eastport, Me	1–2			0.86														0.23			
Elkins, W. Va	25			0.29														0.29			
Erie, Pa	28–29			0.56														0.21			
Escanaba, Mich	8			1.03														0.35			
Evansville, Ind	24			1.20														0.46			
Fort Smith, Ark	5			0.82														0.33			
Fort Worth, Tex	5			0.75														0.55			
Galveston, Tex	22	12:27 p. m.	6:55 p. m.	9.22	3:25 p. m.	4:15 p. m.	0.39	0.17	0.39	0.53	0.75	1.04	1.39	1.72	1.92	2.18	2.55				
					4:15 p. m.	5:05 p. m.		2.77	3.07	3.33	3.59	3.99	4.50	4.93	5.37	5.87	6.26				
					5:05 p. m.	6:00 a. m.		6.53	6.86	7.13	7.46	7.74	7.95	8.11	8.26	8.36	8.51	8.76			
Grand Junction, Colo	23–24			0.15														0.08			
Grand Rapids, Mich	9			0.56														0.28			
Green Bay, Wis	15			0.82														*			
Harrisburg, Pa	1			0.67														0.24			
Hatteras, N. C	9			0.34														0.33			
Huron, S. Dak	21–22			0.55														0.19			
Indianapolis, Ind	25			1.11														0.30			
Jacksonville, Fla	9			0.28														0.17			
Jupiter, Fla	9	1:36 p. m.	7:00 p. m.	2.20	3:12 p. m.	3:32 p. m.	0.44	0.27	0.58	0.89	1.03	1.05	1.06	1.11							
Kalispell, Mont	21			0.37														0.24			
Kansas City, Mo	24–25	12:55 p. m.	10:30 p. m.	3.26	12:15 a. m.	12:37 a. m.	1.43	0.08	0.20	0.47	0.73	0.81									
Key West, Fla	30	7:05 p. m.	10:30 p. m.	2.15	8:27 p. m.	9:03 p. m.	0.12	0.15	0.51	0.85	1.44	1.73	1.85	1.91							
Knoxville, Tenn	20			0.50														0.16			
La Crosse, Wis	22			0.21														0.13			
Lewiston, Idaho	15			0.45														0.20			
Lexington, Ky	26			1.16														0.60			
Lincoln, Nebr	24–25			2.70														0.38			
Little Rock, Ark	24			0.77														0.45			
Los Angeles, Cal	18–19			0.86														0.29			
Louisville, Ky	25			0.53														0.50			
Lynchburg, Va	26–27			0.58														0.38			
Macon, Ga	6			0.57														0.23			
Memphis, Tenn	24	9:10 p. m.	11:50 p. m.	1.35	9:55 p. m.	10:55 p. m.	0.02	0.18	0.38	0.47	0.56	0.64	0.73	0.76	0.80	0.86	1.03	1.19			
Meridian, Miss	7–8			1.79														0.68			
Milwaukee, Wis	23–24			0.76														0.27			
Montgomery, Ala	7–8			1.18														0.50			
Nantucket, Mass	8–9			0.94														0.41			
Nashville, Tenn	1			0.62														0.43			
New Haven, Conn	9–10			0.74														0.44			
New Orleans, La	2	7:10 p. m.	10:30 p. m.	0.82	7:13 p. m.	7:42 p. m.	T.	0.09	0.24	0.37	0.57	0.69	0.74								
New York, N. Y	27–28			1.99														0.34			
Norfolk, Va	26			0.32				0.30													
Northfield, Vt	25			0.18														0.14			
North Head, Wash	4–5			0.73														0.09			
Oklahoma, Okla	21	9:25 p. m.	10:35 p. m.	0.69	10:00 p. m.	10:30 p. m.	0.03	0.05	0.09	0.13	0.27	0.52	0.67								
Omaha, Nebr	24–25			1.10														0.24			
Palestine, Tex	24	6:50 p. m.	10:15 p. m.	2.00	7:03 p. m.	7:55 p. m.	0.03	0.06	0.12	0.14	0.22	0.33	0.61	1.05	1.20	1.52	1.73	1.76			
Parkersburg, W. Va	24–25			0.36														0.15			
Pensacola, Fla	6			0.40									0.39								
Philadelphia, Pa	9			0.25							0.24										
Pittsburg, Pa	1			0.89														0.63			
Pocatello, Idaho	21			0.40														*			
Portland, Me	9–10			0.81														0.35			
Portland, Oreg	4–5			0.49														0.20			
Pueblo, Colo	1			0.15														*			
Raleigh, N. C	17–18			0.15														0.03			
Richmond, Va	8			0.21														0.19			
Rochester, N. Y	9			0.35														0.13			
Sacramento, Cal	18–19			0.55														0.25			
St. Louis, Mo	23–24			0.73														0.19			
St. Paul, Minn	8–9			0.78														0.17			
Salt Lake City, Utah	20–21			1.16														*			
San Antonio, Tex	1–2	4:20 p. m.	3:15 a. m.	2.34	7:05 p. m.	7:25 p. m.	0.65	0.22	0.56	0.76	0.84	0.87									
San Diego, Cal	26			0.07														0.06			
Sandusky, Ohio	8			0.25														0.22			

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
San Francisco, Cal	18-19			0.39														0.16			
Savannah, Ga	8			0.25														*			
Scranton, Pa	27			0.59														0.12			
Seattle, Wash	5			1.19														0.21			
Shreveport, La	7	11:35 a. m.	5:40 p. m.	1.66	11:41 a. m.	12:06 p. m.	0.01	0.14	0.35	0.59	0.73	0.79									
	22	D. N.	11:10 a. m.	0.93	6:35 a. m.	7:00 a. m.	0.09	0.16	0.40	0.49	0.55	0.60									
Spokane, Wash	14-15			0.72														*			
Springfield, Ill	25-26			1.79														0.33			
Springfield, Mo	7-8			0.72														0.36			
Syracuse, N. Y	27-28			0.67														0.12			
Tampa, Fla	9			0.58														0.58			
Taylor, Tex	29			1.52														0.65			
Toledo, Ohio	8			0.38														0.18			
Topeka, Kans	20			1.39														0.57			
Valentine, Nebr	21-22			0.22														*			
Vicksburg, Miss	7-8	2:49 p. m.	D. N.	2.04	7:50 p. m.	8:30 p. m.	1.08	0.06	0.11	0.22	0.27	0.30	0.35	0.47	0.87	0.89					
Washington, D. C	8			0.73														0.47			
Wichita, Kans	20			0.93														*			
Wilmington, N. C	17-18			0.39														0.28			
Wytheville, Va	26			0.50														0.33			
Yankton, S. Dak	6-7			0.84														*			
Havana, Cuba	9-10			0.33														0.10			
San Juan, Porto Rico	24			1.10														0.48			

*Self register not working. † No precipitation during the month.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, April, 1904.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure, in inches. Sea level, reduced to mean of 24 hours.	Pressure, in inches. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
St. Johns, N. F	29.80	29.94	+.05	35.7	+ 1.2	42.8	28.5	6.23	+2.07	0.5
Sydney, C. B. I	29.95	29.99	+.10	36.5	+ 1.5	44.6	28.4	5.22	+1.37	8.0
Halifax, N. S	29.89	30.00	+.04	38.5	+ 0.7	46.6	30.4	6.52	+2.34	15.2
Grand Manan, N. B	29.90	29.95	+.01	38.3	— 0.9	44.8	31.8	5.99	+3.03	12.0
Yarmouth, N. S	29.91	29.98	+.02	38.7	— 0.2	45.5	31.9	6.91	+3.52	12.8
Charlottetown, P. E. I	29.92	29.96	+.06	35.8	+ 0.6	43.1	28.4	3.77	+1.12	7.3
Chatham, N. B	29.91	29.93	+.03	36.8	+ 1.3	48.1	25.4	3.09	+0.46	8.9
Father Point, Que	29.89	29.91	—.02	33.9	+ 0.7	40.3	27.5	1.57	—0.01	7.9
Quebec, Que	29.61	29.94	—.03	35.8	+ 0.7	42.8	28.9	2.70	+0.61	7.1
Montreal, Que	29.73	29.94	—.06	39.8	+ 0.1	46.8	32.9	3.70	+1.46	6.5
Bissett, Ont	29.36	29.98	—.04	35.5	— 2.4	47.1	23.8	2.96	+1.40	8.4
Ottawa, Ont	29.59	29.92	—.10	38.8	— 1.2	46.1	31.4	3.77	+2.27	4.0
Kingston, Ont	29.64	29.96	—.06	38.6	— 1.4	46.2	31.0	3.82	+2.03	3.2
Toronto, Ont	29.60	29.99	—.03	39.2	— 1.6	47.0	31.4	3.11	+0.74	4.7
White River, Ont	28.77	30.13	+.09	29.7	— 3.3	42.0	17.3	1.48	+0.23	10.0
Port Stanley, Ont	29.35	30.01	—.01	37.0	— 4.0	44.4	29.7	4.53	+2.06	17.5
Saugeen, Ont	29.27	29.99	—.04	37.1	— 1.6	45.6	28.6	2.06	+0.26	4.4
Parry Sound, Ont	29.23	29.98	—.09	36.5	— 1.1	46.1	26.9	3.12	+1.21	9.5
Port Arthur, Ont	29.39	30.13	+.10	33.3	— 0.2	42.8	23.8	0.36	—1.36	0.4
Winnipeg, Man	29.29	30.15	+.13	35.1	— 0.8	44.1	26.2	0.46	—0.59	2.0
Minnedosa, Man	28.28	30.14	+.13	34.4	— 1.6	44.2	24.6	1.58	+0.52	13.3
Qu'Appelle, Assin	27.77	30.06	+.07	34.2	— 3.2	42.7	25.7	0.85	—0.20	4.3
Medicine Hat, Assin	27.68	29.97	+.05	45.7	+ 1.2	59.5	31.8	0.53	—0.21	T.
Swift Current, Assin	27.45	30.06	+.10	38.3	— 3.0	48.4	28.2	0.32	—0.61	2.2
Calgary, Alberta	26.40	29.95	+.05	43.0	+ 3.4	57.4	28.5	0.14	—0.50	0.4
Banff, Alberta	25.37	29.99	+.09	39.8	+ 4.5	53.0	26.6	0.96	—0.12	7.0
Edmonton, Alberta	27.65	29.96	+.07	44.2	+ 4.3	56.9	31.4	0.29	—0.59	0.8
Prince Albert, Sask	28.49	30.08	+.10	33.4	+ 0.3	47.5	25.3	T.	—0.83	T.
Battleford, Sask	28.32	30.10	+.13	36.6	— 0.6	46.5	26.8	0.03	—0.44	0.0
Kamloops, B. C	28.70	29.92	—.01	51.1	+ 2.2	63.9	38.2	1.07	+0.68	0.0
Victoria, B. C	29.91	30.01	.00	50.8	+ 4.0	57.4	44.3	0.75	—1.62	0.0
Barkerville, B. C	25.62	29.93	+.07	39.8	+ 6.7	52.0	27.0	1.15	—0.67	5.2
Hamilton, Bermuda	29.94	30.10	+.05	66.1	+ 2.2	71.9	60.2	2.40	—1.78	
Dawson, Yukon										

TABLE VII.—*Heights of rivers referred to zeros of gages, April, 1904.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Mississippi River.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
St. Paul, Minn.	1,954	14	9.9	11, 12	5.5	3	8.3	4.4
Red Wing, Minn.	1,914	14						
Reeds Landing, Minn	1,884	12	7.9	14, 15	3.7	1	6.5	4.2
La Crosse, Wis	1,819	12	9.4	17	6.2	2, 3	8.1	3.2
Prairie du Chien, Wis.	1,759	18	10.9	20	7.4	6	9.1	3.5
Dubuque, Iowa	1,699	18	11.4	22, 23	8.0	7	9.6	3.4
Leclaire, Iowa	1,609	10	7.4	25, 26	5.0	8	6.0	2.4
Davenport, Iowa	1,593	15	9.6	26, 27	7.7	8	8.6	1.9
Muscatine, Iowa	1,562	16	11.9	1	9.1	11	10.2	2.8
Galland, Iowa	1,472	8	6.7	1	4.8	11, 12, 19-21	5.4	1.9
Keokuk, Iowa	1,463	15	12.6	26, 29, 30	8.5	18-21	9.8	4.1
Hannibal, Mo	1,402	13	16.4	28, 29	9.8	7	11.8	6.6
Grafton, Ill	1,306	23	24.0	30	16.0	22	18.7	8.0
St. Louis, Mo	1,264	30	33.6	29, 30	21.2	9	25.1	12.4
Chester, Ill	1,189	30	30.4	30	18.8	9	22.1	11.6
New Madrid, Mo	1,003	34	38.6	6, 7	26.0	25	33.6	12.6
Memphis, Tenn	843	33	39.0	10-12	26.4	27	34.0	12.6
Helena, Ark	767	42	47.7	15	38.3	30	44.0	9.4
Arkansas City, Ark	635	42	49.0	19-22	40.0	1	46.1	9.0
Greenville, Miss	595	42	43.5	20-23	33.7	1	40.2	9.8
Vicksburg, Miss	474	45	46.9	24, 25	36.8	1	43.5	10.1
Natchez, Miss	373	46	45.6	26, 26	35.0	1	41.8	10.6
Baton Rouge, La	240	35	33.7	29, 30	25.3	1	30.1	8.4
Donaldsonville, La	188	28	27.1	28-30	19.6	1	24.0	7.5
New Orleans, La	108	16	17.5	29, 30	12.4	1	15.4	5.1
Yellowstone River.								
Glendive, Mont	98	17	11.9	1	2.2	12-14	3.8	9.7
James River.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Lamoure, N. Dak		25	6.8	23	1.1	1, 2	4.8	5.7
Huron, S. Dak	210	25	3.5	30	0.3	1, 5	1.6	3.2
Missouri River.								
Townsend, Mont	2,504	10	6.4	30	4.1	1-3	4.9	2.3
Fort Benton, Mont	2,285	12	3.7	28, 30	1.6	1-3	2.6	2.1
Bismarck, N. Dak	1,309	14	14.2	7	4.4	27, 28	7.1	9.8
Pierre, S. Dak	1,114	19	12.7	10	4.4	2	7.6	8.3
Sioux City, Iowa	784	18	15.7	12	6.8	1	10.2	8.9
Omaha, Nebr	669	10	16.5	15	6.8	1	11.2	9.7
Plattsmouth, Nebr	641	17	9.7	15	3.2	1, 2	6.3	6.5
St. Joseph, Mo	481	10	10.2	16	1.9	4	6.5	8.3
Kansas City, Mo	388	21	19.9	26	8.4	4	14.6	11.5
Glasgow, Mo	231		16.0	27	5.1	7	10.3	10.9
Boonville, Mo	199	20	20.8	27	8.4	8	14.2	12.4
Hermann, Mo	103	24	23.7	27	8.7	7	15.2	15.0
Des Moines River.								
Des Moines, Iowa	205	19	8.2	26	3.7	1-3, 6	5.9	4.5
Illinois River.								
Peoria, Ill	135	14	22.3	1	15.7	24	18.6	6.6
Allegheny River.								
Warren, Pa	177	14	7.5	3	2.0	26, 27	4.4	5.5
Oil City, Pa	123	13	9.9	1	2.8	25, 26	4.9	7.1
Parker, Pa	73	20	15.0	1	2.9	25	5.8	12.1
Freeport, Pa	29	20	26.5	1	5.2	25	9.8	21.3
Red Bank Creek.								
Brookville, Pa	35	8	12.0	1	1.0	23-27	2.3	11.0

TABLE VII.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Clarion River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Clarion, Pa.	32	10	12.8	1	2.0	24	4.1	10.8
Conemaugh River.								
Johnstown, Pa.	64	7	6.5	1	2.3	24, 25	3.3	4.2
Cheat River.								
Rowlesburg, W. Va.	36	14	5.6	27	2.1	24, 25	3.3	3.5
Youghiogheny River.								
Confluence, Pa.	59	23	4.5	1	1.0	23–25	1.9	3.5
West Newton, Pa.	15	10	6.4	2	1.2	25	2.6	5.2
Monongahela River.								
Weston, W. Va.	161	18	5.9	27	−0.4	10	0.0	6.3
Fairmont, W. Va.	119	25	20.2	28	14.8	23–25	15.9	5.4
Greensboro, Pa.	81	18	14.4	28	7.4	25	9.0	6.8
Lock No. 4, Pa.	40	28	17.2	28	7.0	24, 25	9.4	10.2
Ohio River.								
Pittsburg, Pa.	966	22	21.9	2	3.7	25	8.2	18.2
Davis Island Dam, Pa.	960	25	21.2	2	6.0	25	9.6	15.2
Beaver Dam, Pa.	935	27	33.0	2	7.5	25	13.5	25.5
Wheeling, W. Va.	875	36	33.9	3	7.3	24, 25	13.5	26.6
Parkersburg, W. Va.	785	36	34.8	4	7.4	25	14.9	27.4
Point Pleasant, W. Va.	703	39	35.9	5	7.8	25	17.4	28.1
Huntington, W. Va.	660	50	38.5	6	11.7	25	21.6	26.8
Catlettsburg, Ky.	651	50	39.7	6	10.9	25	21.7	28.8
Portsmouth, Ohio	612	50	41.8	6	12.2	25	23.3	29.6
Cincinnati, Ohio.	499	50	44.3	1	14.8	25	26.6	29.5
Madison, Ind.	413	46	38.8	1	11.0	25	22.6	27.8
Louisville, Ky.	367	28	21.0	1	6.3	25	10.5	14.7
Evansville, Ind.	184	35	39.8	3, 4	13.1	25	25.5	26.7
Paducah, Ky.	47	40	44.7	4	18.2	24	32.4	26.5
Cairo, Ill.	1	45	49.1	5	31.3	24	41.6	17.8
Beaver River.								
Ellwood Junction, Pa.	10	14	13.9	2	3.2	23	4.7	10.7
Muskingum River.								
Zanesville, Ohio	70	20	27.7	4	8.8	24	13.4	18.9
Little Kanawha River.								
Glenville, W. Va.[7]	103	20	.....	.....	.....	.....	.....	.....
New River.								
Radford, Va.	155	14	3.8	29	0.7	26	1.5	3.1
Hinton, W. Va.	95	14	4.8	28	1.8	21–25	2.3	3.0
Great Kanawha River.								
Charleston, W. Va.	58	30	13.3	28	4.3	9	6.4	9.0
Scioto River.								
Columbus, Ohio	110	17	18.6	2	3.0	19–21	5.9	15.6
Licking River.								
Falmouth, Ky.	30	25	13.3	1	3.0	25	6.0	10.3
Miami River.								
Dayton, Ohio	77	18	11.0	2	1.8	22, 23	3.6	9.2
Kentucky River.								
Beattyville, Ky.	254	30	4.5	29	1.0	11–25	1.6	3.5
High Bridge, Ky.	117	17	13.0	30	9.5	24, 25	10.4	3.5
Frankfort, Ky.	65	31	8.6	30	6.3	23–25	7.0	2.3
Wabash River.								
Mount Carmel, Ill.	50	15	27.1	2	6.7	25	17.3	20.4
Clinch River.								
Speers Ferry, Va.	156	20	5.3	28	−0.2	25	0.6	5.5
Clinton, Tenn.	52	25	11.0	30	4.4	25	5.6	6.6
Holston River.								
Bluff City, Tenn.	170	15	4.2	28	0.9	24–26	1.4	3.3
Rogersville, Tenn.	103	14	5.0	29	2.0	22–26	2.5	3.0
French Broad River.								
Asheville, N. C.	144	6	1.0	9	−0.3	25	0.0	1.3
Leadvale, Tenn.	70	15	1.5	28	−0.4	20, 25	0.2	1.9
Hiwassee River.								
Charleston, Tenn	18	22	4.0	9	1.6	23–25	2.2	2.4
Tennessee River.								
Knoxville, Tenn.	635	29	5.4	30	1.6	25	2.5	3.8
Kingston, Tenn.	556	25	5.6	2	2.5	26	3.3	3.1
Chattanooga, Tenn.	452	33	9.0	1	3.7	27	5.1	5.3
Bridgeport, Ala.	402	24	7.5	1	2.4	27, 28	3.7	5.1
Florence, Ala.	255	16	11.3	1	2.3	30	4.8	9.0
Riverton, Ala.	225	25	19.5	1	2.6	30	6.5	16.9
Johnsonville, Tenn.	95	21	26.9	1	4.9	30	10.9	22.0
Cumberland River.								
Burnside, Ky.	518	50	6.7	29	2.3	18–20	3.7	4.4
Celina, Tenn.	383	45	13.3	1	4.2	17–20	6.2	9.1
Carthage, Tenn.	308	40	15.1	1	4.0	18, 20–22	5.9	11.1
Nashville, Tenn.	193	40	31.9	1	6.0	22–24	9.8	25.9
Clarksville, Tenn.	126	42	40.4	1	8.2	23, 24	14.4	32.2
Arkansas River.								
Wichita, Kans.	832	10	2.1	25	−0.2	12–19	0.2	2.3
Webbers Falls, Ind. T.	465	23	12.3	28	3.1	23–25	4.9	9.2
Fort Smith, Ark.	403	22	12.8	29	3.6	21	5.9	9.2
Dardanelle, Ark.	256	21	12.4	30	3.8	22	6.0	8.6
Little Rock, Ark.	176	23	13.5	1	5.5	23	7.7	8.0
White River.								
Newport, Ark.	150	26	26.3	1	14.1	25	18.6	12.2
Yazoo River.								
Yazoo City, Miss.	80	25	22.6	26–29	15.4	1	20.0	7.2
Ouachita River.								
Camden, Ark.	304	39	30.6	1	13.3	23	22.8	17.3
Monroe, La.	122	40	29.5	15–20	21.2	1	27.3	8.3
Red River.								
Arthur City, Tex.	688	27	7.8	25, 26	5.0	4–6, 17–23	6.2	2.8
Fulton, Ark.	515	28	19.8	1, 2	9.0	22, 23	13.6	10.8
Shreveport, La.	327	29	12.9	1	7.9	24	10.3	5.0
Alexandria, La.	118	33	19.3	10, 11	11.0	29, 30	15.2	8.3
Atchafalaya River.								
Melville, La.	100	31	34.2	29, 30	29.5	1	32.2	4.7
Penobscot River.								
Mattawamkeag, Me.[3]	87	.....	16.2	30	13.4	18, 19	14.3	2.8
Montague, Me.[4]	60	.....	11.2	12	7.7	21, 22	9.3	3.5
Kennebec River.								
Winslow, Me.	46	.....	8.6	30	3.5	14	5.0	5.1
Merrimac River.								
Franklin Junction, N. H.[4]	110	.....	13.1	30	5.6	18–20	7.4	7.5
Merrimac River—Cont'd.								
Concord, N. H.	94	.....	6.9	30	2.6	18, 19	3.7	4.3
Manchester, N. H.	68	.....	5.7	30	1.9	18	3.3	3.8
Connecticut River.								
Wells River, Vt.	255	.....	30.0	13	26.0	1, 19, 20	27.3	4.0
White River Junction, Vt.	200	.....	14.8	30	8.4	20	10.7	6.4
Bellows Falls, Vt.	170	12	7.6	30	2.9	21, 22	4.6	4.7
Holyoke, Mass.	84	9	8.1	30	3.0	22, 23	4.8	5.1
Hartford, Conn.	50	13	18.3	30	7.6	24	12.2	10.7
Housatonic River.								
Gaylordsville, Conn.	50	15	6.7	2–4	5.1	25	6.0	1.6
Mohawk River.								
Utica, N. Y.[7]	98	.....	.....	.....	.....	.....	.....	.....
Tribeshill, N. Y.	42	.....	9.5	2	−0.4	21–24	2.5	9.9
Schenectady, N. Y.	19	.....	9.7	11	3.3	22, 23	6.0	6.4
Hudson River.								
Glens Falls, N. Y.	197	.....	13.0	11	8.0	23	9.8	5.0
Troy, N. Y.	154	.....	16.0	11	6.8	23	11.2	9.2
Albany, N. Y.	147	.....	11.9	11	4.3	23	7.8	7.6
Stuyvesant, N. Y.[7]	128	.....	.....	.....	.....	.....	.....	.....
Passaic River.								
Chatham, N. J.	69	.....	4.7	2	2.6	21–26	3.2	2.1
Pompton River.								
Pompton Plains, N. J.[1]	6	.....	.....	.....	.....	.....	.....	.....
North Branch Susquehanna.								
Binghamton, N. Y.	306	16	9.0	2	3.7	25	5.8	5.3
Towanda, Pa.	262	16	9.4	11	3.4	25	5.6	6.0
Wilkesbarre, Pa.	183	17	16.2	11	6.9	26	10.3	9.3
West Branch Susquehanna.								
Lockhaven, Pa.	65	12	8.8	2	1.0	25	2.5	7.8
Williamsport, Pa.	39	20	17.2	2	3.2	25	6.6	14.0
Susquehanna River.								
Selinsgrove, Pa.	116	17	11.0	3	2.5	26	5.2	8.5
Harrisburg, Pa.	69	17	13.7	3	3.9	22	6.9	9.8
Juniata River.								
Huntingdon, Pa.	90	24	8.5	2	3.9	23–26	4.9	4.6
Potomac River.								
Cumberland, Md.	290	8	5.5	28–30	3.4	24	4.1	2.1
Harpers Ferry, W. Va.	172	18	7.5	30	0.5	26, 27	2.4	7.0
Shenandoah River.								
Riverton, Va.	58	22	6.0	30	0.4	1–29	0.6	5.6
James River.								
Lynchburg, Va.	260	18	6.1	28	1.1	26	2.1	5.0
Richmond, Va.	111	12	3.3	30	−0.2	15	0.5	3.5
Dan River.								
Danville, Va.	55	8	0.4	29	−0.3	22–26	−0.1	0.7
Roanoke River.								
Clarksville, Va.	196	12	3.9	1, 2, 28	2.4	26	3.3	1.5
Weldon, N. C.	129	30	11.7	30	9.1	22–26	9.7	2.6
Cape Fear River.								
Fayetteville, N. C.	112	38	8.8	29	3.4	24	5.0	5.4
Waccamaw River.								
Conway, S. C.	40	7	6.0	1	1.6	28	3.4	4.4
Pedee River.								
Cheraw, S. C.	149	27	3.1	1	1.8	25, 26	2.4	1.3
Smiths Mills, S. C.	51	16	10.6	1	2.8	28–30	5.5	7.8
Lynch Creek.								
Effingham, S. C.	35	12	8.5	1	4.0	29, 30	5.2	4.5
Black River.								
Kingstree, S. C.	52	12	8.4	1	3.0	29, 30	6.0	5.4
Wateree River.								
Camden, S. C.	45	24	8.0	1	6.0	25–27	6.8	2.0
Congaree River.								
Columbia, S. C.	37	15	1.6	1–6	0.0	25–27, 29, 30	0.7	1.6
Santee River.								
St. Stephens, S. C.	50	12	7.0	1	2.3	30	3.8	4.7
Savannah River.								
Calhoun Falls, S. C.	347	15	3.0	9	2.3	23–25, 30	2.5	0.7
Augusta, Ga.	268	32	9.8	11	7.4	25, 27	9.1	2.4
Broad River.								
Carlton, Ga.	30	11	2.7	9	2.2	24, 25, 29, 30	2.4	0.5
Oconee River.								
Dublin, Ga.	79	30	3.0	11, 12	1.0	16–30	1.6	2.0
Ocmulgee River.								
Macon, Ga.	203	18	5.7	9	2.8	{6, 18, 19, 26, 27}	3.2	2.9
Abbeville, Ga.	96	11	6.0	12, 13	2.7	26, 29, 30	3.8	3.3
Flint River.								
Woodbury, Ga.	.....	.....	1.9	9	0.4	{19, 21, 22, 24, 26, 28, 29}	0.6	1.5
Albany, Ga.	80	20	5.9	11, 12	2.0	29, 30	3.4	3.9
Chattahoochee River.								
Oakdale, Ga.	305	18	5.0	10	1.5	{6, 24–26, 29, 30}	2.0	3.5
West Point, Ga.	239	20	3.6	9	2.6	24–30	2.8	1.0
Eufaula, Ala.	90	40	6.0	10	2.0	26–30	3.3	4.0
Coosa River.								
Rome, Ga.	271	30	5.8	9	2.0	19–30	2.6	3.8
Gadsden, Ga.	144	22	6.0	11	1.4	25	2.7	4.6
Lock No. 4, Ala.	116	17	5.4	11	1.5	26	2.7	3.9
Wetumpka, Ala.	6	45	9.0	12	3.5	26	5.6	5.5
Tallapoosa River.								
Milstead, Ala.	38	35	5.8	9	1.8	19–24	2.3	4.0
Alabama River.								
Montgomery, Ala.	265	35	5.9	12	1.9	26	3.4	4.0
Selma, Ala.	212	35	7.4	1, 11	1.9	27–30	4.3	5.5
Tombigbee River.								
Columbus, Miss.	303	33	6.2	4	−1.2	30	2.5	7.4
Demopolis, Ala.	155	35	19.2	1	2.6	30	9.5	16.6
Black Warrior River.								
Tuscaloosa, Ala.	90	43	20.5	10	7.0	24	10.4	13.5
Sabine River.								
Logansport, La.	180	25	18.6	13	10.2	7	15.4	8.4
Orange, Tex.	10	7	2.0	24, 25	−0.6	1, 2	0.4	2.6
Neches River.								
Rockland, Tex.	110	20	7.0	7	2.5	29–24	3.9	4.5

TABLE VII.—*Heights of rivers referred to zeros of gages.*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Neches River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet*	*Feet.*
Beaumont, Tex	40	10	2.2	24	0.5	10	1.2	1.7
Trinity River.								
Dallas, Tex	330	23	25.9	11	2.7	22	6.8	23.2
Riverside, Tex	100	40	15.1	5	7.0	11	10.6	8.1
Liberty, Tex	42	25	17.5	8	9.9	14	12.7	7.6
Brazos River.								
Kopperl, Tex	369	21	2.8	6	0.8	17–21, 30	1.6	2.0
Waco, Tex	301	24	4.2	8	2.8	22,23,28,30	3.2	1.4
Hempstead, Tex	215	40	4.8	4	0.0	24–26	1.8	4.8
Booth, Tex	76	39	4.9	11	2.3	1, 27–30	3.2	2.6
Colorado River.						{1, 2, 6, 8–13, 21, 23, 28–30}		
Ballinger, Tex	460	21	2.0	14, 15	1.0		1.4	1.0

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Colorado River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Austin, Tex	214	18	5.8	24	0.9	16–21	1.4	4.9
Columbus, Tex	100	24	11.3	27	5.4	17–22	6.3	5.9
Red River of the North.								
Moorhead, Minn.	418	26	21.3	29	11.0	2	15.4	10.3
Columbia River								
Umatilla, Oreg.	270	25	17.3	30	6.7	2,3	12.4	10.6
The Dalles, Oreg.	166	40	28.9	19	9.7	1	20.7	19.2
Willamette River.								
Albany, Oreg.	118	20	11.5	14	6.2	25	8.5	5.3
Portland, Oreg.	12	15	18.0	20, 21	9.3	3, 5	14.0	8.7
Sacramento River.								
Red Bluff, Cal.	265	23	15.4	27	8.6	5, 6	11.1	6.8
Sacramento, Cal.	64	25	24.0	1	20.8	30	22.1	3.2

[1] Record incomplete. [2] Frozen 1 day. [3] Frozen 6 days. [4] 29 days only. [5] 26 days only. [6] Frozen 8 days. [7] No record.

HAWAIIAN CLIMATOLOGICAL DATA.

By R. C. LYDECKER, Territorial Meteorologist.

Rainfall data for April, 1904.

Stations.	Elevation.	Amount.
HAWAII.		
HILO, e. and ne.	*Feet.*	*Inches.*
Waiakea	50	22.88
Hilo (town)	.....	.....
Puueo	85	26.51
Kaumana	1,250	49.83
Pepeekeo	100	24.06
Hakalau	200	34.30
Honohina	300	29.63
Puuohua	1,050	56.39
Laupahoehoe	500	47.37
Ookala	400	35.75
HAMAKUA, ne.		
Kukaiau	250	33.10
Paauilo	300	31.26
Paauhau	300	20.37
Honokaa (Mill)	425	20.80
Honokaa (Meinicke)	1,100	33.49
Kukuihaele	700	22.42
KOHALA, n.		
Awini Ranch	1,100	27.74
Halawa	450	18.20
Niulii	200	16.85
Kohala (Mission)	321	16.49
Kohala (Sugar Co.)	270	17.73
Hawi Mill	700	17.58
Puakea Ranch	600	12.25
Puuhue Ranch	1,847	9.40
Waimea	2,720	7.29
KONA, w.		
Huehue	2,000	3.57
Holualoa	1,350	11.86
Kaukahoku Leheula	3,500	.....
Kainaliu	1,470	.....
Kealakekua	1,580	15.37
Napoopoo	25	.....
Hoopuloa	1,650	8.42
Hoopuloa	2,300	16.89
Puuwaawaa Ranch	2,700	3.75
Huehue	.....	.....
KAU, se.		
Kahuku Ranch	2,000	7.29
Honuapo	15	9.86
Naalehu	650	8.77
Hilea	310	6.10
Pahala	850	7.06
Volcano House	4,000	20.29
PUNA, e.		
Olaa, Mountain View (Russel)	1,330	47.24
Olaa Plantation (Mill)	210	30.82
Olaa (20 miles)	1,700	61.01
Kapoho	110	2.72
Pahoa	600	15.07
MAUI.		
Lahaina	.....	.....
Waiopae Ranch	700	1.82
Kaupo (Mokulau), s.	285	6.05
Kipahulu, s	308	.....
Hana	.....	.....
Nahiku, ne	850	26.22
Nahiku	1,600	40.16
Haiku, n	700	9.92
Kula (Erehwon), n	4,500	2.99
Kula (Waiakoa), n	2,700	0.55
Puuomalei, n	1,400	12.72
Paia	180	.....
Haleakala Ranch	2,000	6.89
Wailuku, ne	250	0.51

Stations.	Elevation.	Amount.
LANAI.	*Feet.*	*Inches.*
Keomuku	10	0.07
OAHU.		
Punahou (W. B.), sw.	47	3.03
Kulaokahua (Castle), sw.	50	1.51
Makiki Reservoir	120	.....
U. S. Naval Station, sw.	6	1.66
Kapiolani Park, sw.	10	.....
College Hills	175	4.38
Manoa (Woodlawn Dairy), c.	285	8.58
Manoa (Rhodes Gardens)	360	10.47
Insane Asylum	30	.....
School street (Bishop), sw.	.....	.....
Kamehameha School	.....	.....
Kalihi-Uka, sw.	485	9.77
Nuuanu (W. W. Hall), sw.	50	3.20
Nuuanu (Wyllie street)	250	5.18
Nuuanu (Elec. Station), sw.	405	7.66
Nuuanu (Luakaha), e.	850	17.62
U. S. Experiment Station	350	4.09
Kaliula	1,150	.....
Laniakea (Nahuina)	.....	.....
Tantalus Heights (Frear)	1,360	9.36
Waimanalo, ne.	25	2.03
Maunawili, ne.	300	4.59
Kaneohe	100	5.37
Ahuimanu, ne.	350	8.57
Kahuku, n	25	2.46
Waialua	.....	.....
Wahiawa	900	0.55
Ewa Plantation, s.	60	0.49
U. S. Magnetic Station	45	0.40
Waipahu	200	0.09
Moanalua	15	0.96
Pacific Heights	.....	.....
KAUAI.		
Lihue (Grove Farm), e.	200	4.92
Lihue (Molokoa), e.	300	4.05
Lihue (Kukaua), e.	1,000	20.03
Lihue (Kilohana)	400	4.12
Kealia, e.	15	.....
Kilauea (Plantation), ne.	325	10.44
Hanalei, n.	10	.....
Waioli	.....	.....
Haena	.....	.....
Waiawa	32	.....
Elecle	150	.....
Wahiawa (Mountain)	3,000	.....
McBryde (Residence)	850	6.56
Lawai (Gov. Road)	450	9.24
Lawai, w.	225	2.72
Lawai, e.	800	8.03
Koloa	100	2.87
Lawai Beach	.....	3.02
Delayed March reports.		
Hanalei	.....	21.90
Lihue (Kilohana)	.....	11.12
Kalihi-uka	.....	11.15
Olaa Mill	.....	0.35
Olaa	1,530	1.31
Hilo	.....	0.85
Halawa	.....	4.15
Ookala	.....	6.60
Kahuku Ranch	.....	4.37
Lawai Beach	.....	5.24
Wahiawa Mountain	.....	4.78
U. S. Magnetic Station	.....	5.58

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

Meteorological Observations at Honolulu, April, 1904.

The station is at 21° 18′ north, 157° 50′ west. It is the Hawaiian Weather Bureau station Punahou. (See fig. 2, No. 1, in the MONTHLY WEATHER REVIEW for July, 1902, page 365.)

Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.

The pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

Rainfall for twenty-four hours is measured at 9 a. m. local, or 7:31 p. m., Greenwich time.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 2:30 a. m. Honolulu time.								Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.			Sea-level pressures.	
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.	Average cloudiness.	Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.96	72	67.5	79	67	66.5	81	sw.-ne.	1-0	8	30.00	29.91	0.01
2	29.97	68	66.5	76	70	65.7	80	ne.	1-0	5-10	30.03	29.96	0.04
3	29.96	69	66.5	78	68	66.7	85	sw.	1-0	4-10	30.03	29.98	0.02
4	29.92	67	66.5	79	68	66.5	83	sw.-w.	0	8-10	29.99	29.91	0.02
5	29.95	70	67	79	67	65.7	82	sw.	0	5-10	29.97	29.91	0.23
6	29.99	68	66.5	78	68	65.3	77	ne.	1-0	8-4	30.03	29.94	0.01
7	29.94	69	67	80	67	65.5	76	ne.	0-2	4	30.04	29.95	0.00
8	29.88	71	64.5	79	69	65.3	77	ne.	0-2	3	29.96	29.86	T.
9	29.94	67	59	75	69	61.7	74	nne.-ne.	2-6	5	29.97	29.85	0.03
10	30.02	69	62.5	73	66	55.0	62	ne.	5-4	2	30.07	29.96	0.07
11	30.03	68	63	74	68	58.3	67	ne.	4	1	30.08	30.00	T.
12	29.99	69	62.5	76	66	59.0	70	ne.	4-2	3	30.07	29.96	0.03
13	29.97	65	63	75	68	58.0	66	ne.	3-1	1-4	30.04	29.96	0.01
14	29.99	70	66	77	63	62.5	75	ne.	0-3	1-8-3	30.03	29.94	0.03
15	30.01	72	66	78	69	65.3	73	ne.	0-2	6	30.04	29.96	0.06
16	30.00	70	65	78	71	62.3	69	ne.	1-2	4	30.05	29.97	0.02
17	30.02	70	64.5	77	69	62.5	74	ne.	2-4	3-9	30.06	29.99	0.03
18	30.02	70	62	76	67	60.5	72	ne.	4	5-8	30.07	30.01	0.32
19	30.00	72	64.5	75	69	59.5	66	ne.	2-3	5-8	30.07	30.00	0.01
20	30.06	72	67	78	69	62.0	71	ne.	1-0	3-10	30.10	30.00	T.
21	30.04	72	65.5	78	67	63.3	71	ene.-ne.	3	9-4	30.12	30.05	1.12
22	30.01	72	65.5	77	71	62.5	74	ne.	2-4	8-5	30.09	30.00	0.09
23	30.01	72	67	78	70	62.7	70	ne.	4-2	3	30.07	29.99	0.16
24	30.04	71	64	78	71	64.0	75	ne.	3-4	4	30.08	30.01	0.11
25	30.06	71	65	76	70	61.3	70	ne.	4-3	3	30.10	30.04	0.16
26	30.04	72	65.5	78	69	61.5	68	ne.	3-4	3	30.10	30.03	0.18
27	30.03	72	66	77	71	62.7	71	ne.	3	3-5	30.08	30.01	0.43
28	30.05	71	64.5	78	70	61.7	69	ne.	3	3	30.08	30.00	0.20
29	30.04	72	64.5	78	71	60.5	65	ne.	2-3	3	30.10	30.01	0.01
30	30.05	71	65	78	71	62.0	66	ne.	1-3	3	30.11	30.02	0.03
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sums	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.03
Means	30.000	70.1	64.9	77.2	68.7	62.5	72.6	.....	2.2	4.8	30.054	29.973	.....
Departure.	—.016	.....	.....	.....	.....	—0.8	—0.4	.....	.....	—0.3	.....	.....	+0.13

Mean temperature for the month of April, 1904 (6 + 2 + 9), + 3 = 72.5°; normal is 72.5°.
Mean pressure for the month of April, 1904, (9 + 3) + 2 = 30.013; normal is 30.029.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. ‡ These values are the means of (6 + 9 + 2 + 9) ÷ 4. § Beaufort scale.

Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

GENERAL SUMMARY FOR APRIL, 1904.

The meteorological summary for April is as follows:

Honolulu.—Temperature mean for the month, 72.5°; normal, 72.5°; average daily maximum, 77.2°; average daily minimum, 68.7°; mean daily range, 8.5°; greatest daily range, 14°

(13th); least daily range, 5° (1st); highest temperature, 80° (6th); lowest temperature, 63° (13th).

Barometer average, 30.013; normal, 30.029; highest, 30.12 (20th); lowest, 29.85 (8th); greatest 24-hour change, that is from any given hour of one day to the same hour on the next, .11 (3 p. m. 8th to 3 p. m. 9th); lows passed this point 4th, 7th, and 8th; highs, 10th, 11th, and 17th to 30th, inclusive.

Relative humidity average, 72.6 per cent; normal, 73.0 per cent; mean dew-point, 62.5°; normal, 63.3°; mean absolute moisture, 6.22 grains per cubic foot; normal, 6.42 grains.

Rainfall, 3.03 inches; normal, 2.90 inches; greatest rainfall in twenty-four hours, 1.12 inches (from 9 a. m. 19th to 9 a. m. 20th); rain record days, 26; normal, 17. The total precipitation from January 1 to May 1 was 40.81 inches; the normal yearly rainfall is 37.58 inches, or 3.23 inches less than the fall for the first four months of this year.

The artesian well water level rose from 35.85 to 36.30 feet above mean sea level. These are the highest figures reached since observations began in March, 1899. April 30, 1903, it stood at 34.75. The average daily mean sea level was 9.79, the assumed annual mean being 10 feet above datum. For April, 1903, it was 9.65.

Trade wind days, 27; normal, 20; average force of wind, Beaufort scale and during daylight, 2.2; average cloudiness, tenths of sky, 4.8; normal, 5.1.

Approximate percentages of district rainfall as compared with normal: Hawaii, Hilo district, 259 per cent; Hamakua, 360; Kohala, 356; Waimea, 235; Kona, 330; Kau, 256; Puna, 159; Island of Maui, variable, from 22 per cent at Wailuku to 262 per cent at Haleakala Ranch; Oahu, Honolulu district, 92 per cent; Nuuanu, 119; Koolau, 116; Ewa, 61; Island of Kauai, 167 per cent.

The heaviest monthly rainfall was at Olaa (20-mile station), 61.01 inches. The heaviest 24-hour rainfalls were at Honokaa, 8.40 inches (11th); Olaa (20 miles), 7.26 (13th), and Kaumana, 6.68 (10th), all on Hawaii.

Ewa Mill, dew-point, 61.0°; relative humidity, 69.0 per cent; barometer average, 30.00 inches.

Kohala, dew-point, 64.5°; relative humidity, 82.7 per cent.

United States Magnetic Station, dew-point, 63.5°; relative humidity, 71.0 per cent.

Honolulu, dew 6 mornings; slight earthquake 4th at 7:39 a. m.; also reported from Hawaii and Maui.

Temperature table for April, 1904.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.	Highest.	Lowest.
	Feet.	°	°	°	°	°
Hilo	50	81.1	65.7	72.7	89	63
Pepeekeo	100	75.3	68.1	71.0	82	66
Olaa Mill	210	82.6	63.3	72.3	89	58
Kohala	521	75.2	65.4	69.6	81	62
Waimea	2,730	68.5	58.5	62.9	76	56
Volcano House	4,000	68.2	52.2	59.5	75	48
Waiakoa	2,700	82.0	56.9	68.8	91	51
Keomuku	10	80.1	73.0	75.4	89	69
Kinau Street (Castle)	50	78.5	69.4	72.9	82	61
United States Magnetic Station	50	80.5	66.4	72.8	84	61
Ewa Mill	60	78.4	65.6	71.3	81	60
United States Experiment Station	350	78.7	67.4	72.3	83	64

Reported from other stations: Kohala, Hawaii, heaviest April rainfall in twenty-years, 16.49 inches falling; the normal April rainfall for this station is 4.89 inches; earthquake at 7:40 a. m., 4th; trade-wind days 25, balance of month northerly. Hilo, earthquake 7:35 a. m. 4th and 10:55 p. m. 30th. Pepeekeo, earthquake 4th at 7:35 a. m. and heavy shock at 10:15 p. m. 29th; heavy surf 8th to 13th and 16th to 29th, inclusive; winds mostly east-northeast, average force 2.4; average cloudiness 8.2. Waimea, strong northeast winds prevailed with gale on 20th and 21st.

NOTE.—The March summary gave the heaviest monthly rainfall as 19.97 inches at Maunawili, Oahu; a delayed report from Hanalei, Kauai, gives a fall of 21.90 inches, which was the heaviest for March.

COSTA RICAN CLIMATOLOGICAL DATA.

Communicated by Mr. H. PITTIER, Director, Physico-Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San José de Costa Rica, during April, 1904.*

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Duration, 1904.
	Inches.	*Inches.*	° *F.*	° *F.*	%	%	*Ins.*	*Ins.*	*Hrs.*
1 a. m	26.15	26.14	62.5	63.5	87	84	.....	0.02	.....
2 a. m	26.13	26.13	62.1	63.1	87	84	.....	0.01	.....
3 a. m	26.11	26.12	61.6	62.6	86	85	.....	T.	.....
4 a. m	26.11	26.11	61.2	62.2	87	85	.....	0.01	.....
5 a. m	26.11	26.11	60.8	62.1	87	84	.....	T.	.....
6 a. m	26.12	26.13	60.4	61.9	88	85	.....	T.	.....
7 a. m	26.13	26.14	61.2	62.6	84	82	.....	T.	.....
8 a. m	26.14	26.16	65.8	67.5	70	74	.....	0.01	.....
9 a. m	26.15	26.17	70.2	71.2	63	69	.....	0.01	.....
10 a. m	26.16	26.17	73.8	74.3	61	60	.....	0.01	.....
11 a. m	26.15	26.16	76.8	76.8	54	53	.....	0.01	.....
Noon	26.14	26.15	79.0	77.9	51	58	.....	0.02	.....
1 p. m	26.13	26.13	79.3	79.2	54	53	.....	0.06	.....
2 p. m	26.10	26.11	76.6	79.0	58	54	0.64	0.11	1.17
3 p. m	26.09	26.09	74.8	76.8	62	59	1.36	0.26	4.33
4 p. m	26.08	26.08	72.3	74.5	70	64	0.25	0.16	2.33
5 p. m	26.08	26.09	69.6	71.8	75	70	0.11	0.20	2.16
6 p. m	26.09	26.10	68.0	69.8	79	75	0.11	0.15	1.00
7 p. m	26.10	26.12	66.6	67.5	82	78	0.10	0.21	1.00
8 p. m	26.12	26.13	65.6	66.4	84	81	0.11	0.08	1.67
9 p. m	26.14	26.15	64.9	65.7	85	82	0.28	0.06	1.00
10 p. m	26.15	26.16	64.1	64.9	86	83	0.06	0.05	1.50
11 p. m	26.16	26.17	63.3	64.2	87	83	0.06	0.06	2.00
Midnight	26.15	26.16	62.6	63.8	88	84	0.01	0.02	0.67
Mean	26.13	26.13	67.6	68.7	75	74	.....	.....	.....
Minimum	26.02	26.00	55.6	51.4	37	.....	.....	.....	.....
Maximum	26.21	26.26	86.5	94.5	100	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	3.09	1.52	18.83

REMARKS.—At San José the barometer is 3,835 feet above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 5 feet above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 5 feet above ground. Since January 1, 1902, observations at San José have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San José local time. The normals for pressure, temperature, and relative humidity have been adjusted to this time; the normal for rainfall in Table 1 and the sunshine observations and normal in Table 2 refer to local time. At Port Limon the hours of direct observation are 8 a. m., 2 and 8 p. m., San José local time; the barometer is 14 feet above sea level. The means for temperature and relative humidity in Table 4 are obtained from two-hourly readings given by a Richard self-registering thermometer.

TABLE 2.—*San José, April, 1904.*

Time.	Sunshine.		Cloudiness.		Temperature of the soil at depth of—				
	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	6 inches.	12 inches.	24 inches.	48 inches.	120 inches.
	Hours.	*Hours.*	%	%	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*
7 a. m	13.70	12.57	52	47	70.6	71.2	72.0	71.2	70.3
8 a. m	25.43	21.74	.....	.....	.....	.....	.....	.....	.....
9 a. m	24.33	22.26	.....	.....	.....	.....	.....	.....	.....
10 a. m	24.56	21.58	58	55	70.7	71.1	72.7	71.2	.....
11 a. m	23.83	21.43	.....	.....	.....	.....	.....	.....	.....
Noon	20.06	20.03	.....	.....	.....	.....	.....	.....	.....
1 p. m	17.82	19.88	70	63	72.0	71.4	72.1	71.2	.....
2 p. m	15.74	19.50	.....	.....	.....	.....	.....	.....	.....
3 p. m	10.98	17.47	.....	.....	.....	.....	.....	.....	.....
4 p. m	7.46	14.01	88	72	72.7	72.0	72.1	71.2	.....
5 p. m	4.68	10.29	.....	.....	.....	.....	.....	.....	.....
6 p. m	1.41	5.14	.....	.....	.....	.....	.....	.....	.....
7 p. m	.....	.....	78	69	72.5	72.1	72.1	71.2	.....
8 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
9 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
10 p. m	.....	.....	48	56	72.1	72.1	72.1	71.2	.....
11 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
Midnight	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean	.....	.....	68	60	71.7	71.7	72.1	71.2	70.3
Total	190.60	205.90	.....	.....	.....	.....	.....	.....	.....

TABLE 3.—*Rainfall at stations in Costa Rica, April, 1904.*

Stations.	Height above sea level.	Observed, 1904.		Averages.		
		Amount.	Number of days.	Number of years.	Amount.	Number of days.
	Feet.	*Inches.*			*Inches.*	
Sipurio (Talamanca)	197	.....	4	4	11.38	13
Boca Banano	10	4.61	15	8	15.20	19
Port Limon	10	.....	.....	10	10.63	11
Swamp Mouth	10	4.53	12	6	11.77	15
Zent	66	11.65	21	3	13.31	15
Siquirres	197	1.42	7	6	13.11	15
Dos Novillos	400	.....	.....	.....	.....	.....
Guapiles	984	8.03	14	4	11.93	14
Cariblanco (Sarapiqui)	2,740	.....	.....	6	10.67	18
San Carlos	528	4.88	15	6	5.39	16
Las Lomas	873	8.98	18	4	9.92	11
Peralta	1,089	1.73	21	6	8.58	14
Turrialba	2,034	.....	.....	9	6.93	13
Juan Viñas	3,412	1.81	9	8	4.61	10
Santiago	3,609	4.72	14	3	9.37	12
Paraiso	4,383	0.35	6	3	2.40	12
Cachi	3,346	.....	.....	3	3.19	12
Las Concavas	4,386	3.86	15	3	3.54	15
Cartago	4,761	.....	.....	3	2.28	11
Tres Rios	4,265	.....	.....	15	2.09	5
San Francisco Guadalupe	3,894	3.31	9	8	2.16	7
San José	3,806	3.09	8	15	1.50	7
La Verbena	3,740	1.89	15	8	1.18	4
Nuestro Amo	2,595	6.73	10	8	1.18	5
Alajuela	3,117	.....	.....	4	1.69	4
San Isidro Alajuela	4,416	8.07	18	3	2.32	6
Las Cañas	2,559	.....	.....	.....	.....	.....
Puntarenas	.....	1.34	7	.....	.....	.....

Notes on earthquakes.—April 8, 1h 28m p. m., slight tremor. April 23, 10h 35m p. m., very light shock NW.–SE., intensity I, duration 4 seconds.

CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table in advance of the regular monthly weather report for Jamaica:

Comparative table of rainfall for April, 1904.

[Based upon the average stations only.]

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1904.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	21	4.11	5.37
Northern division	22	52	4.18	3.30
West-central division	26	26	10.26	7.32
Southern division	27	35	5.10	4.14
Means	100	134	5.91	5.03

The rainfall for April was, therefore, above the average for the whole island; the greatest fall, 20.80 inches, occurred at Brownsville, in the west-central division, while 0.19 inch was recorded at Plumb Point Light-house in the southern division.

• Barkerville

Chart I. Tracks of Centers of High Areas. April, 1904.

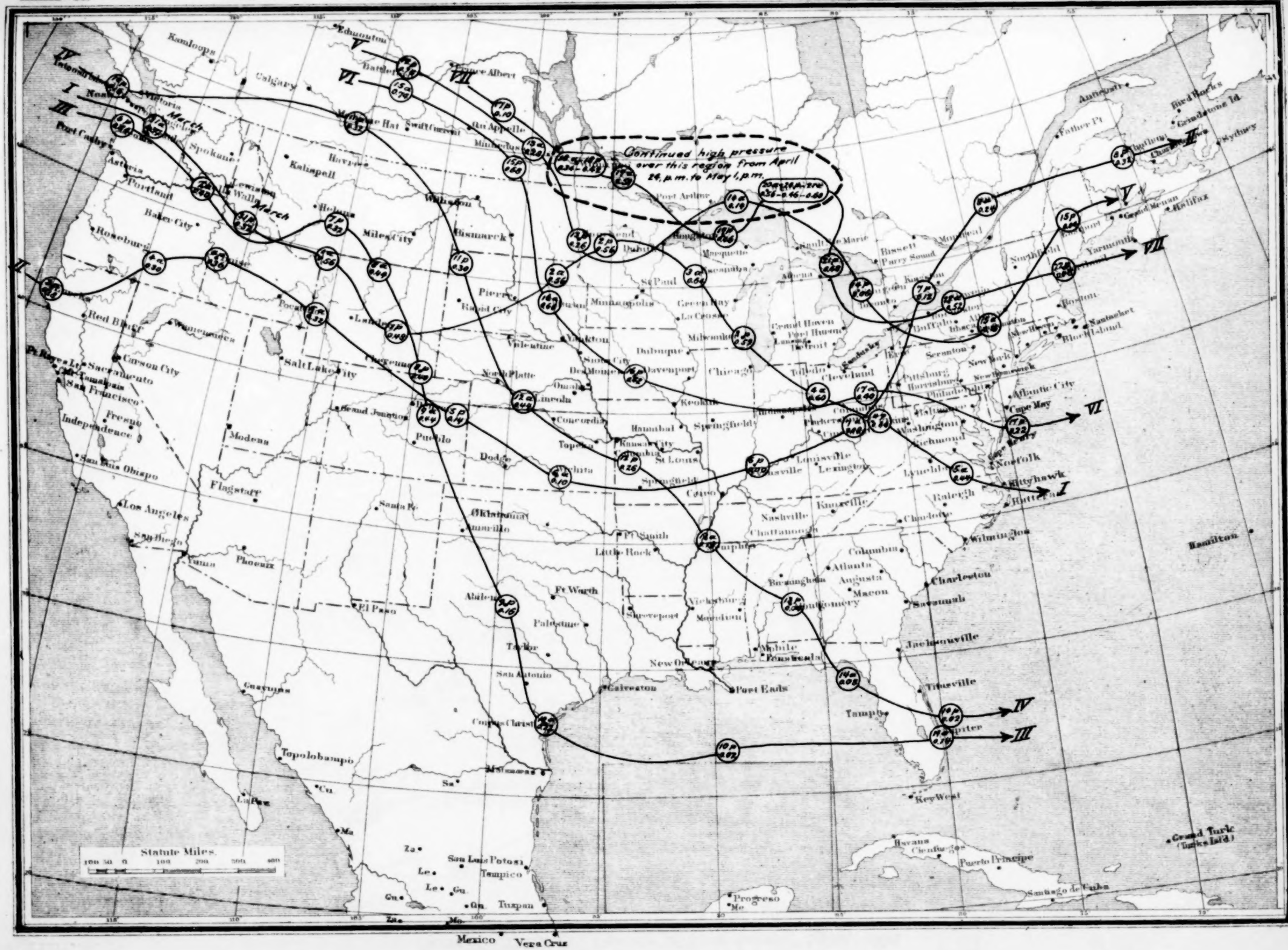

Chart II. Tracks of Centers of Low Areas. April, 1904.

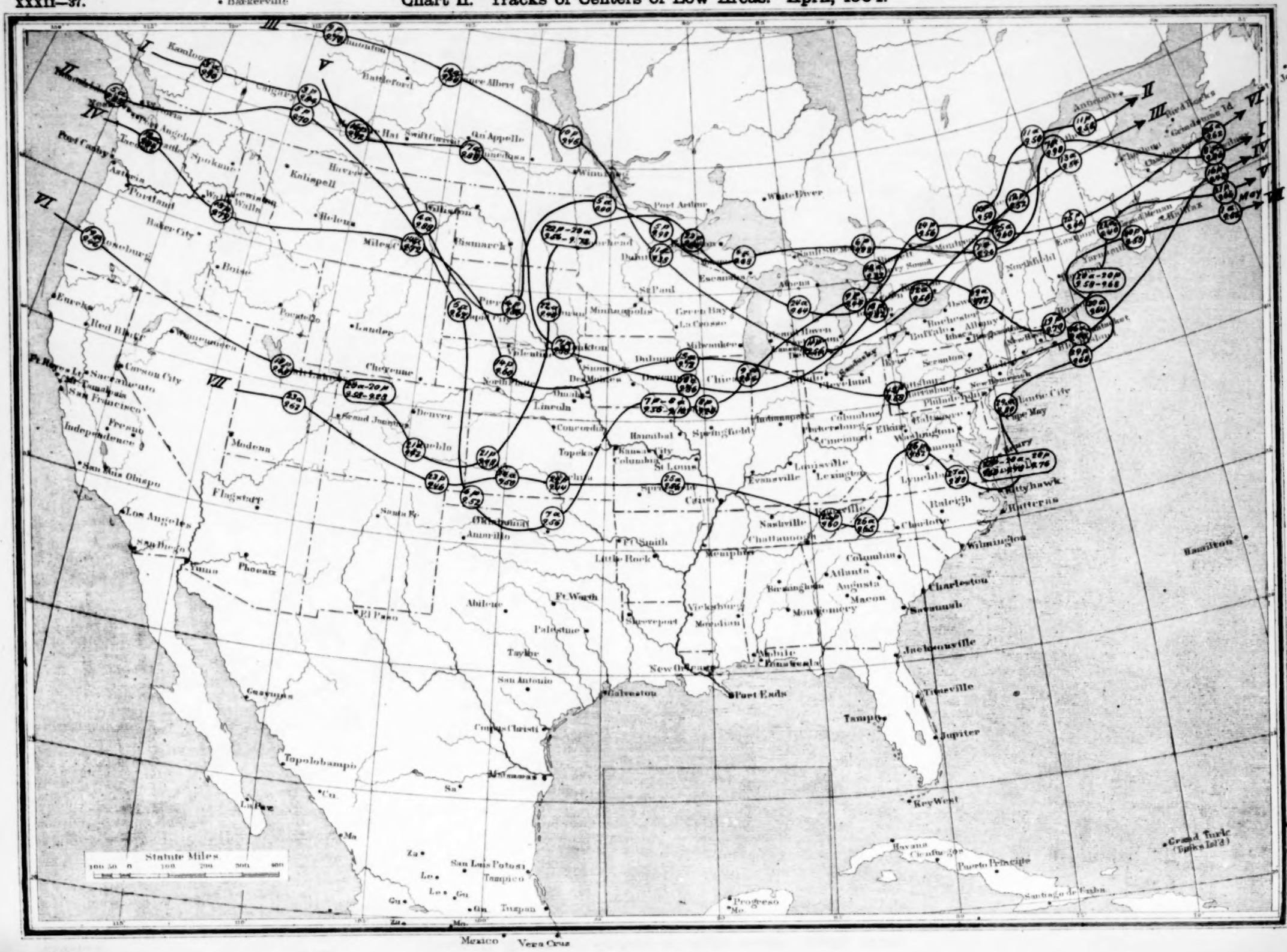

Chart III. Total Precipitation. April, 1904.

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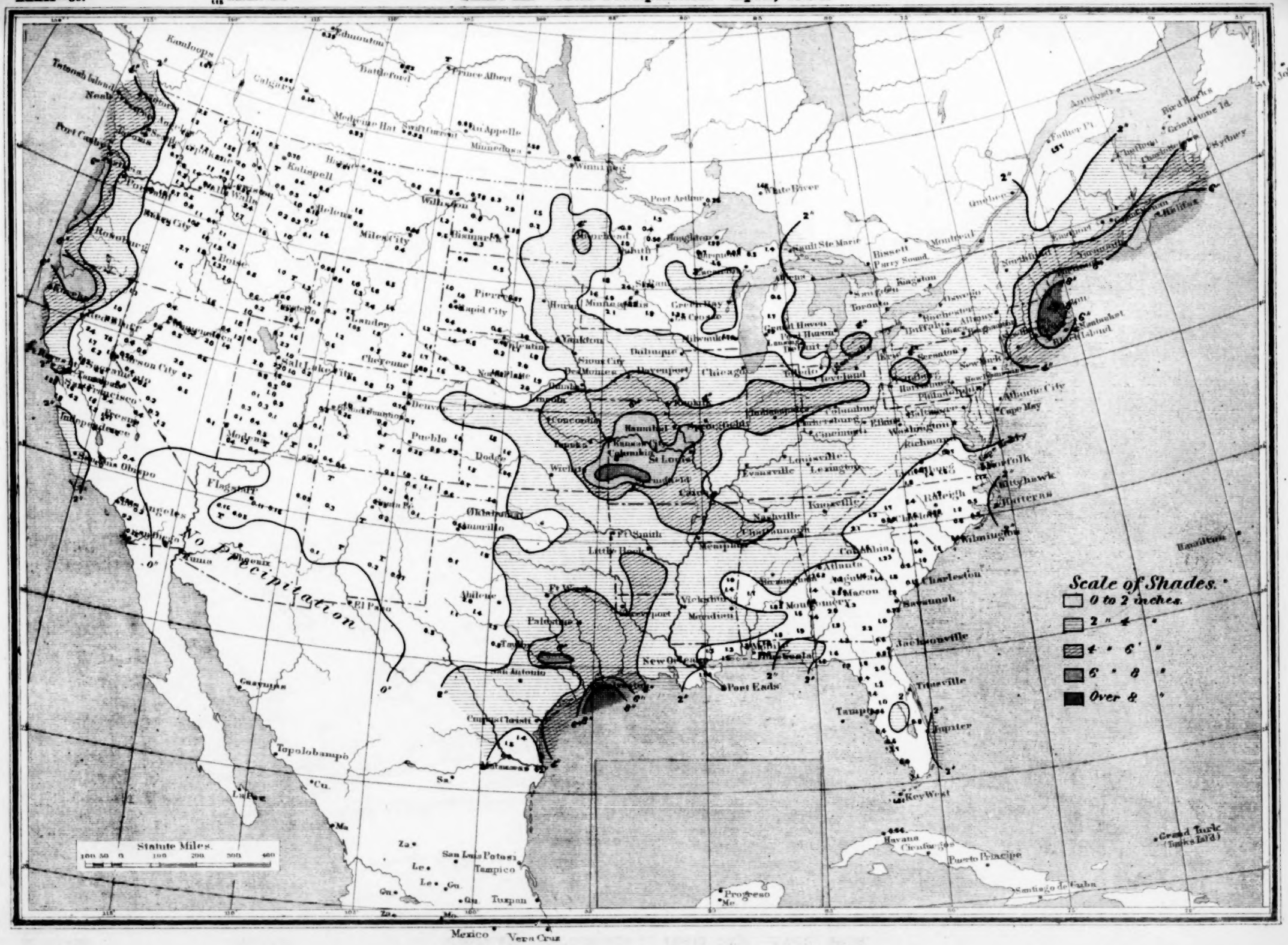

Chart IV. Percentage of Clear Sky. April, 1904.

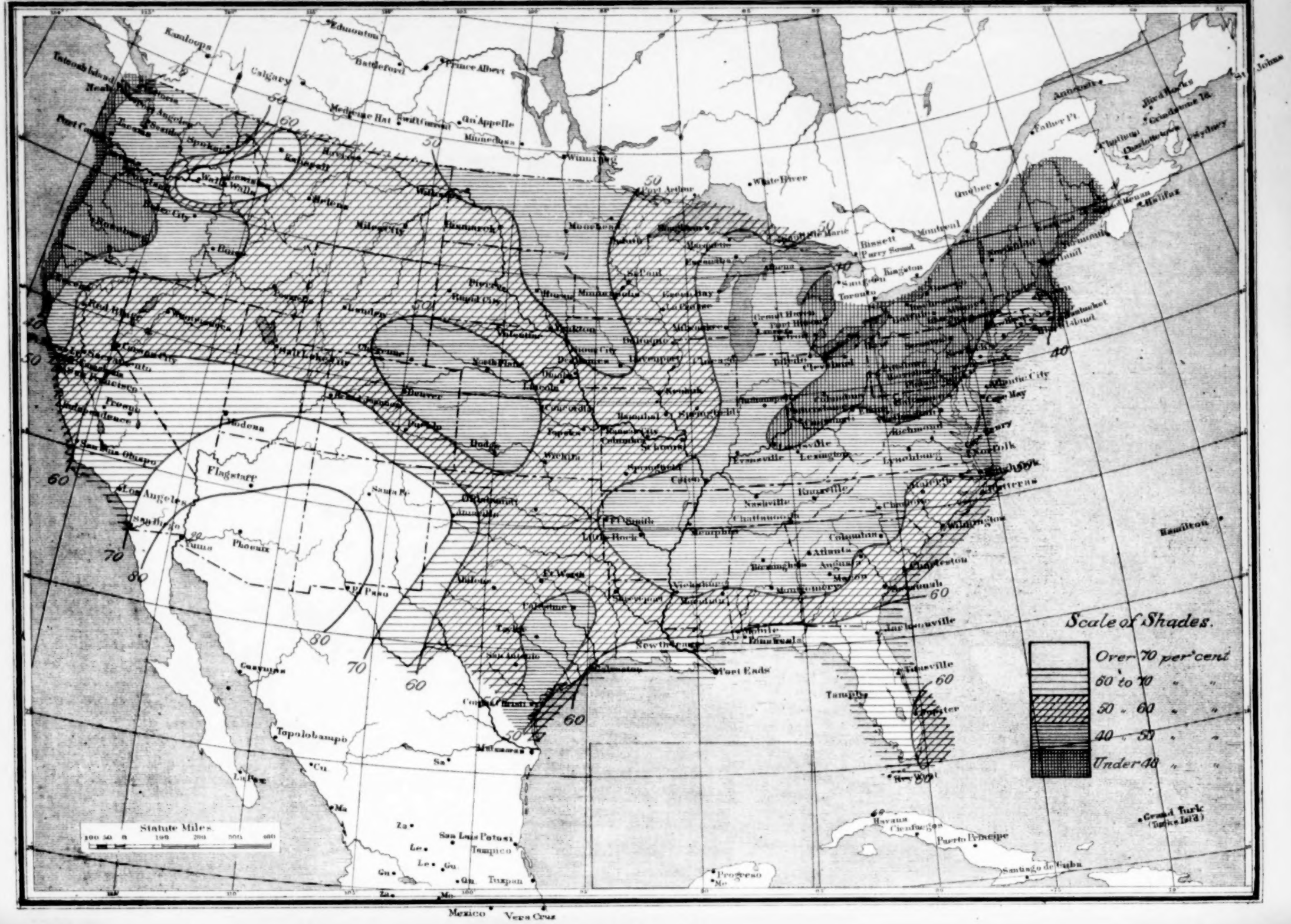

Chart V. Surface Temperatures: Maximum, Minimum, and Mean. April, 1904.

Chart V. Surface Temperatures; Maximum, Minimum, and Mean. April, 1904.

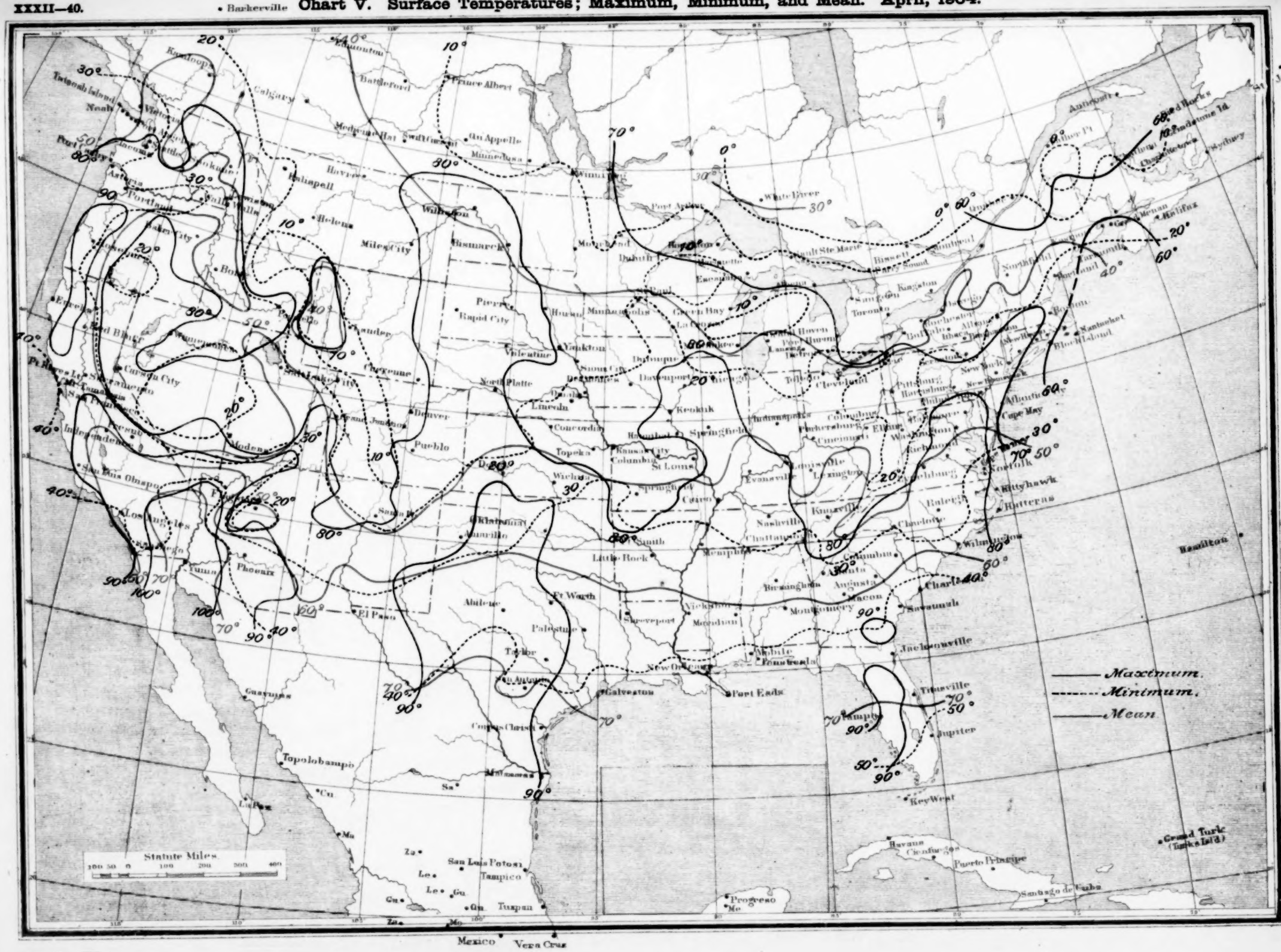

Chart VI. Isobars and Isotherms at 10,000 feet. April, 1904.

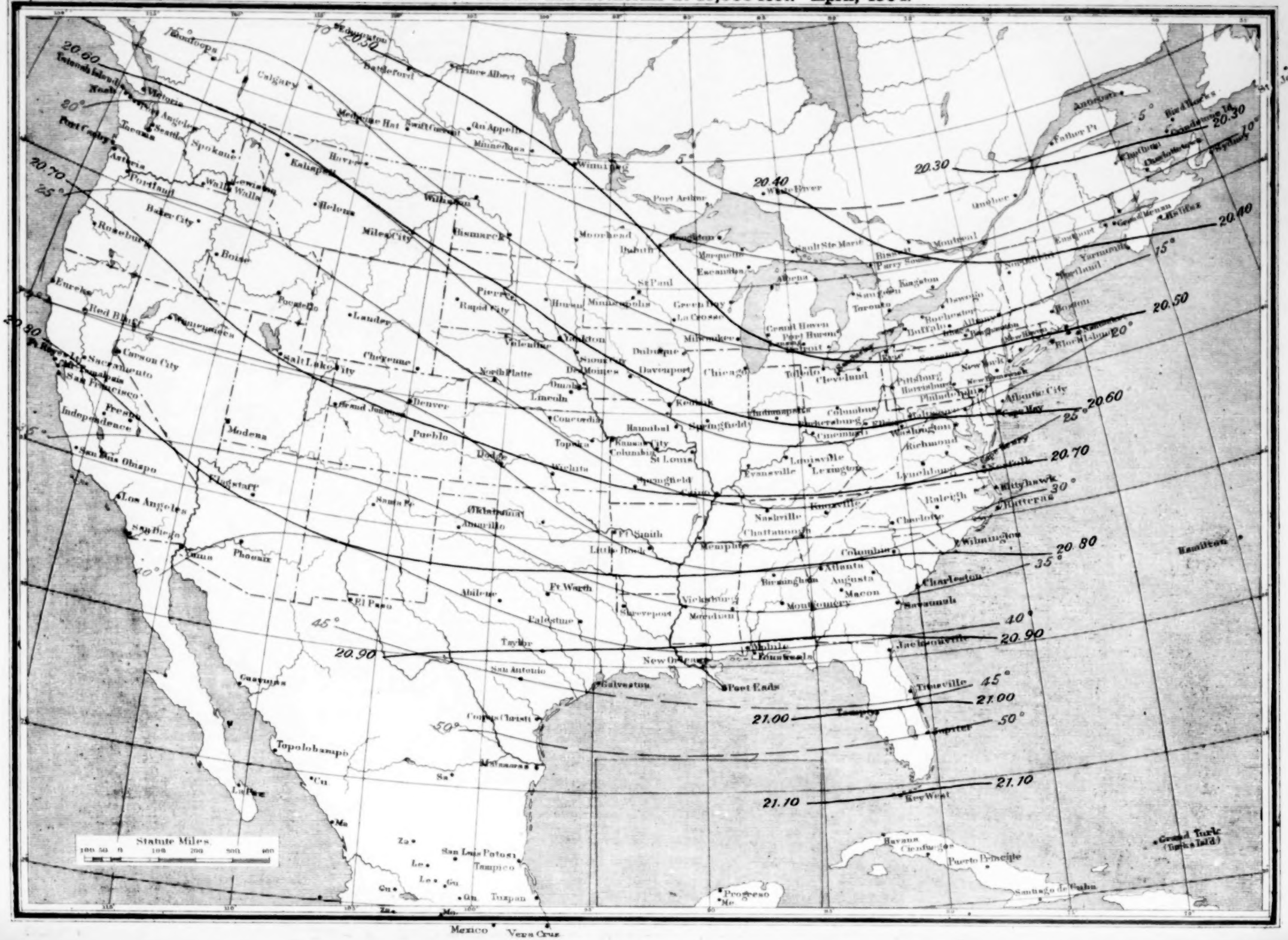

Chart VII. Isobars and Isotherms at 3500 feet. April, 1904.

• Barkerville

Chart VII. Isobars and Isotherms at 3500 feet. April, 1904.

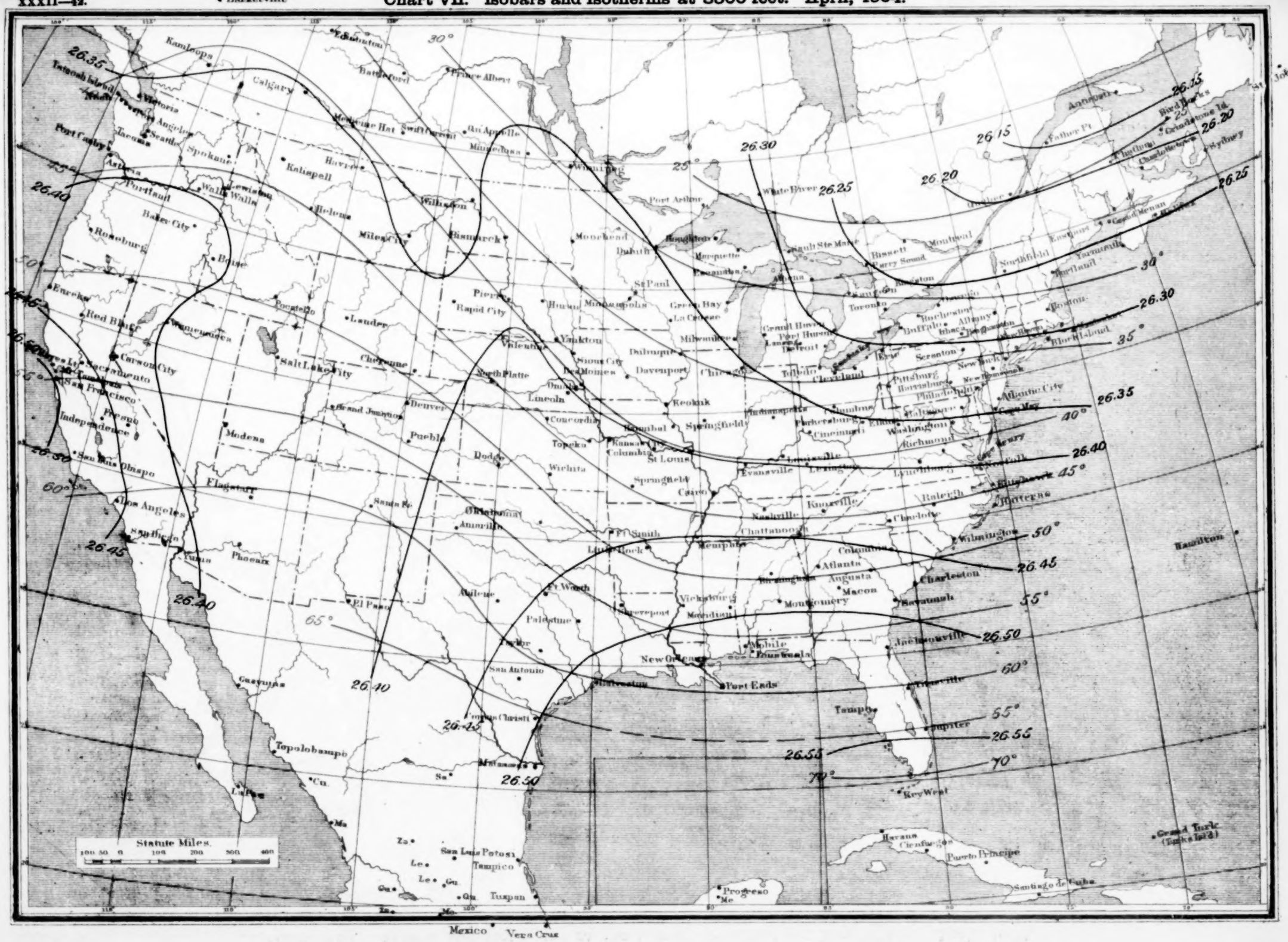

Chart VIII. Isobars and Isotherms at Sea Level; Resultant Surface Winds. April, 1904.

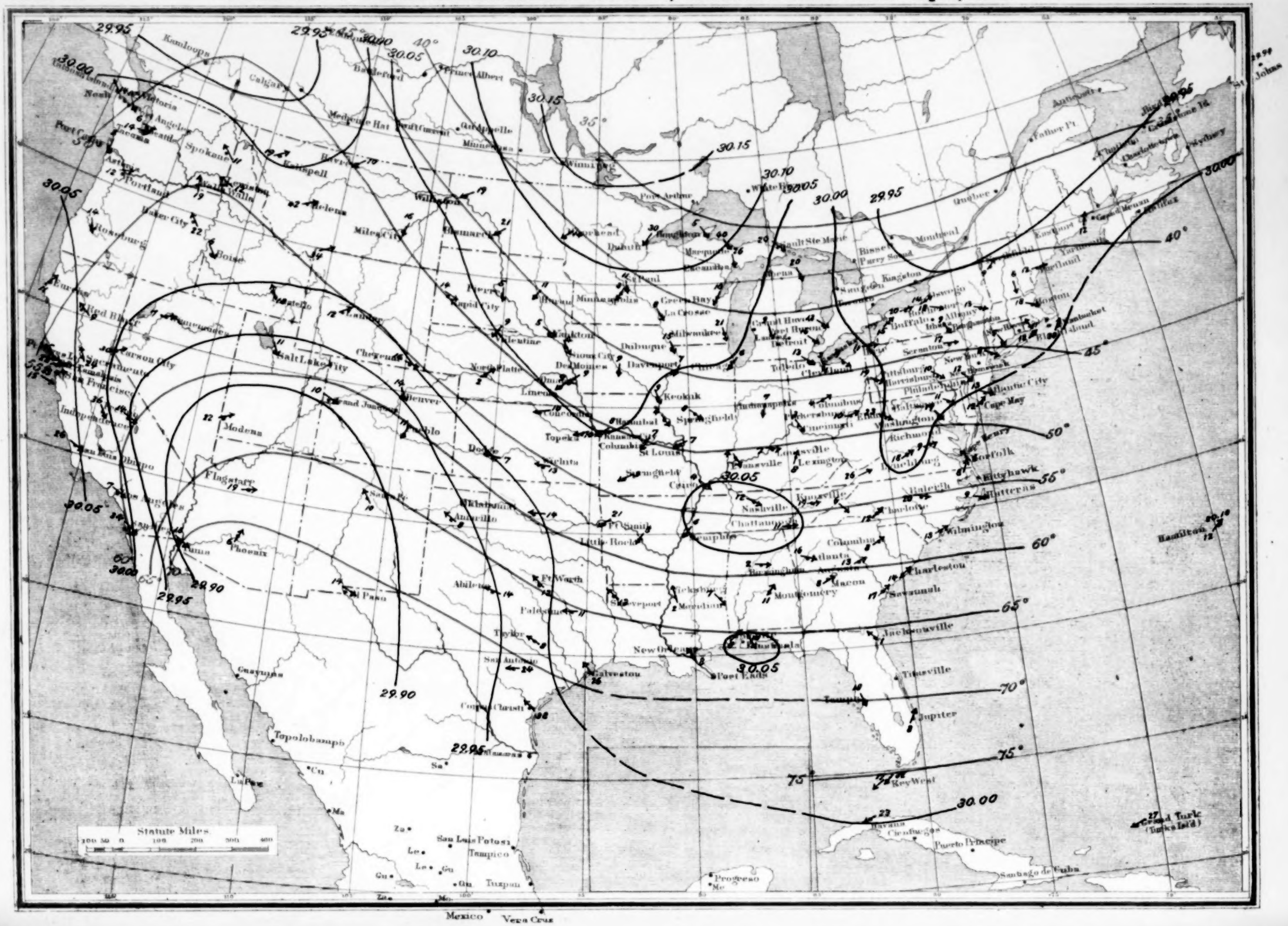

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. April, 1904.

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. April, 1904.

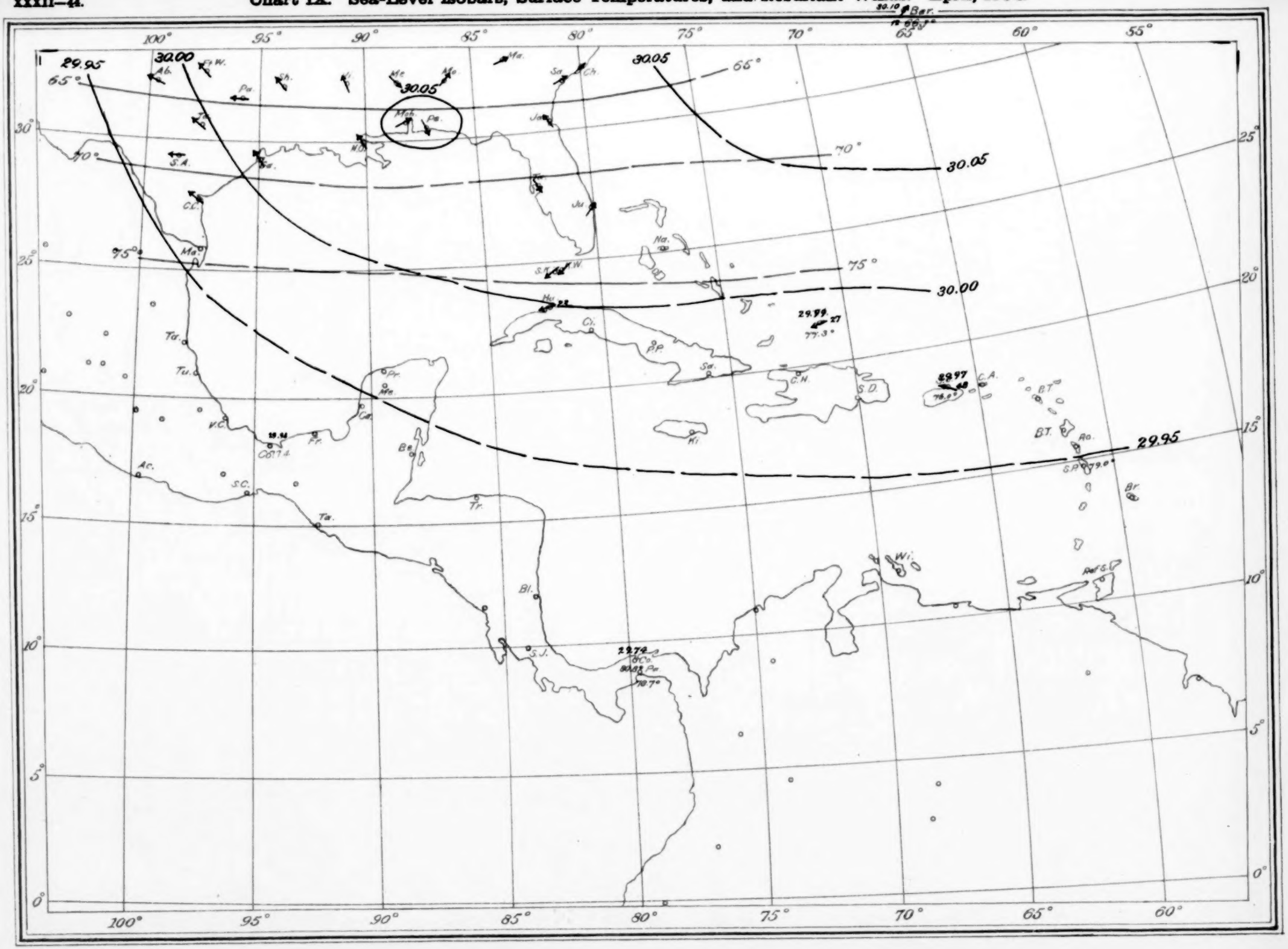

Chart X. Hydrographs for Seven Principal Rivers of the United States. April, 1904.

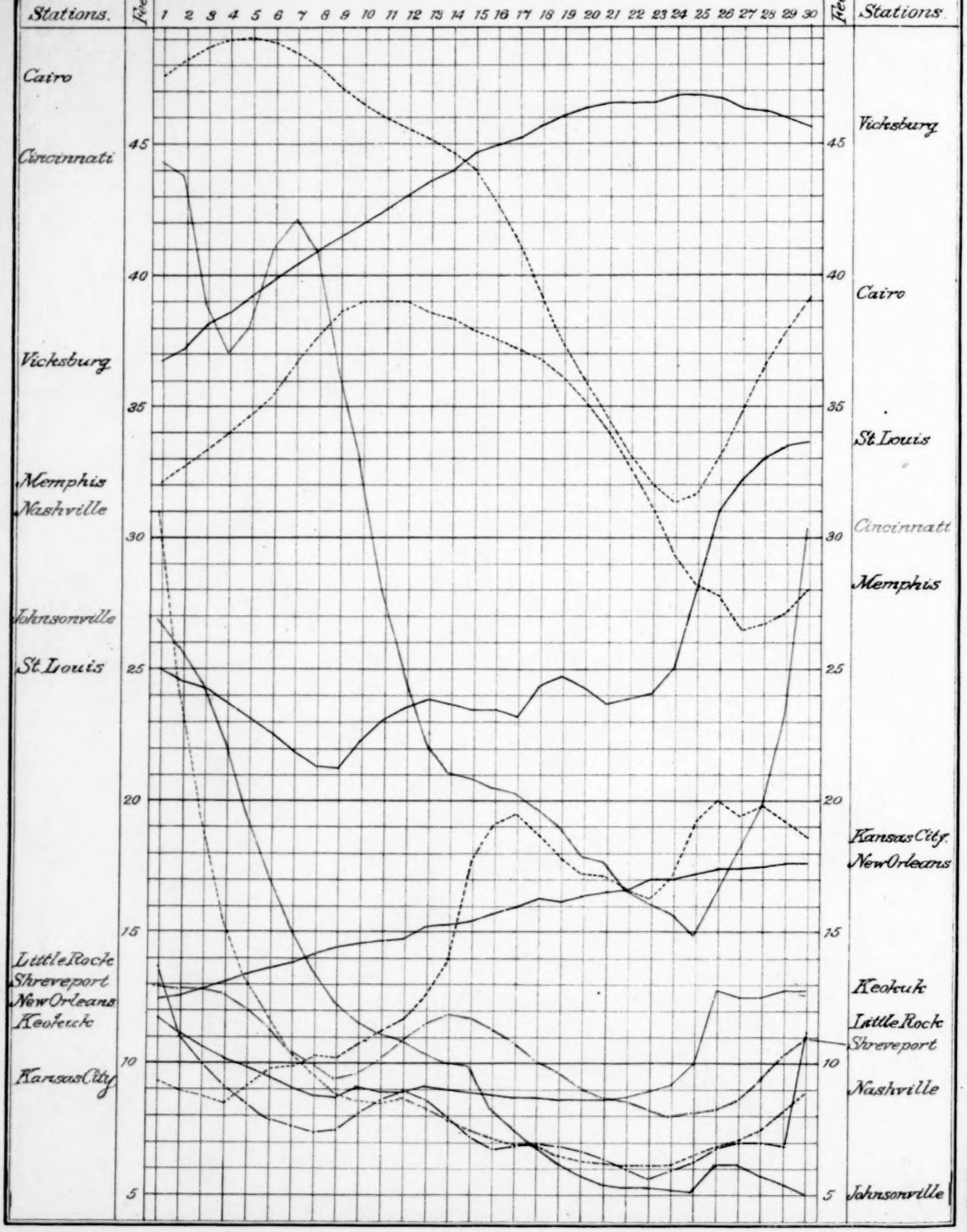

Chart XI. Total Snowfall. April, 1904.

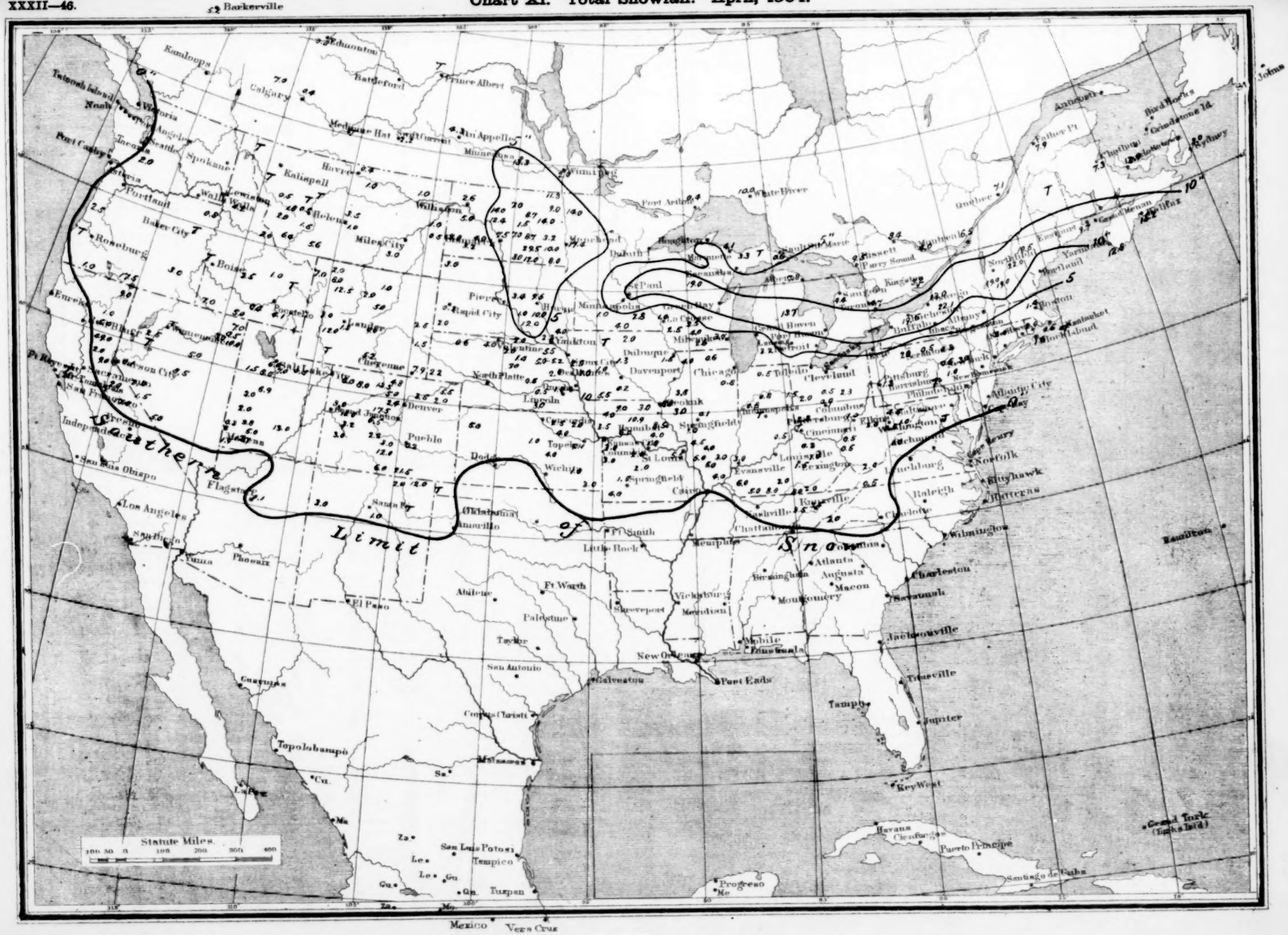

Chart XII A. Average monthly vectors of the general circulation in the West Indies at the various cloud levels. First arrangement.

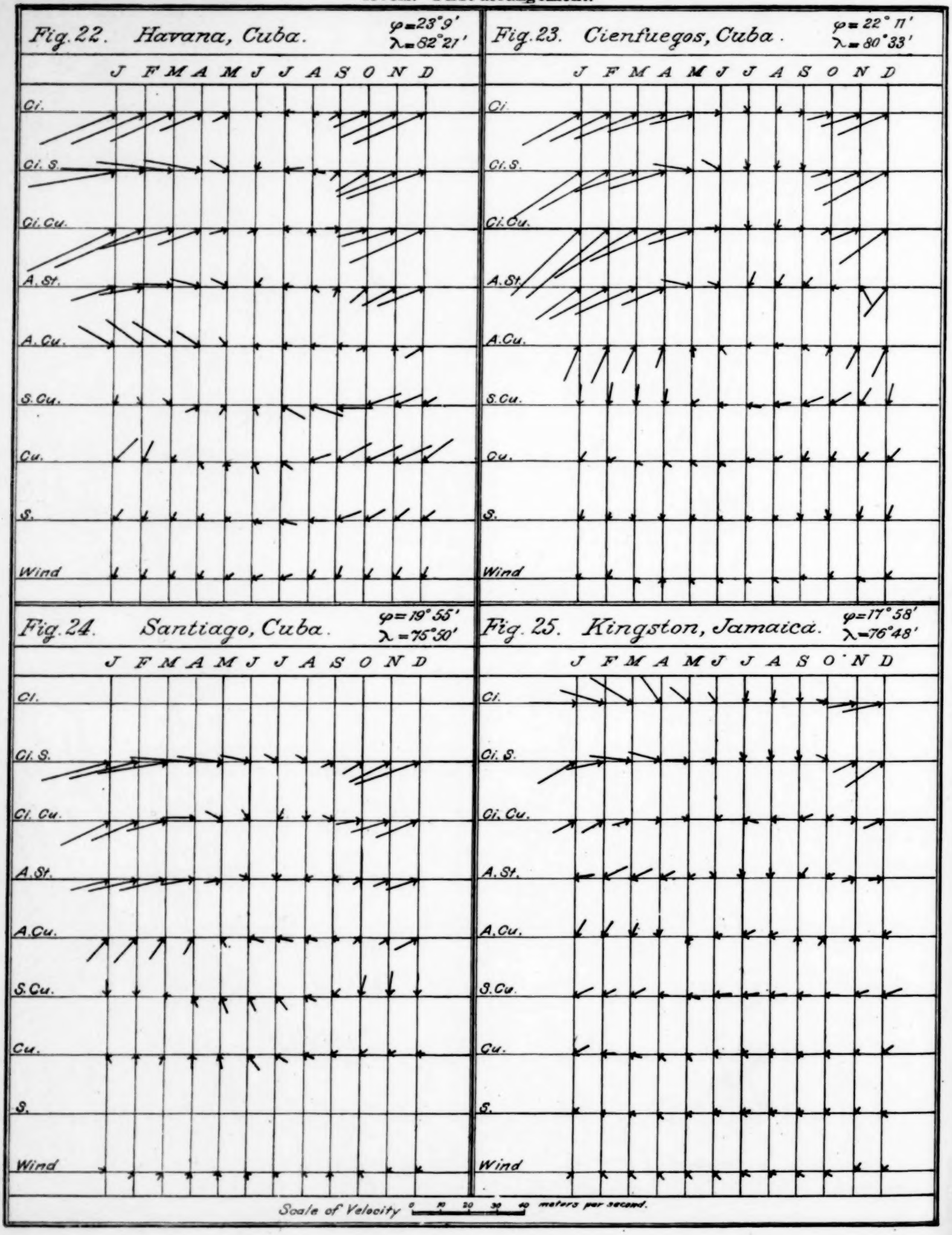
Fig. 22. Havana, Cuba. φ=23°9' λ=82°21'
Fig. 23. Cienfuegos, Cuba. φ=22°11' λ=80°33'
Fig. 24. Santiago, Cuba. φ=19°55' λ=75°50'
Fig. 25. Kingston, Jamaica. φ=17°58' λ=76°48'
J F M A M J J A S O N D
Ci.
Ci. S.
Ci. Cu.
A. St.
A. Cu.
S. Cu.
Cu.
S.
Wind
Scale of Velocity 0 10 20 30 40 meters per second.

Chart XII B. Average monthly vectors of the general circulation in the West Indies at the various cloud levels. First arrangement.

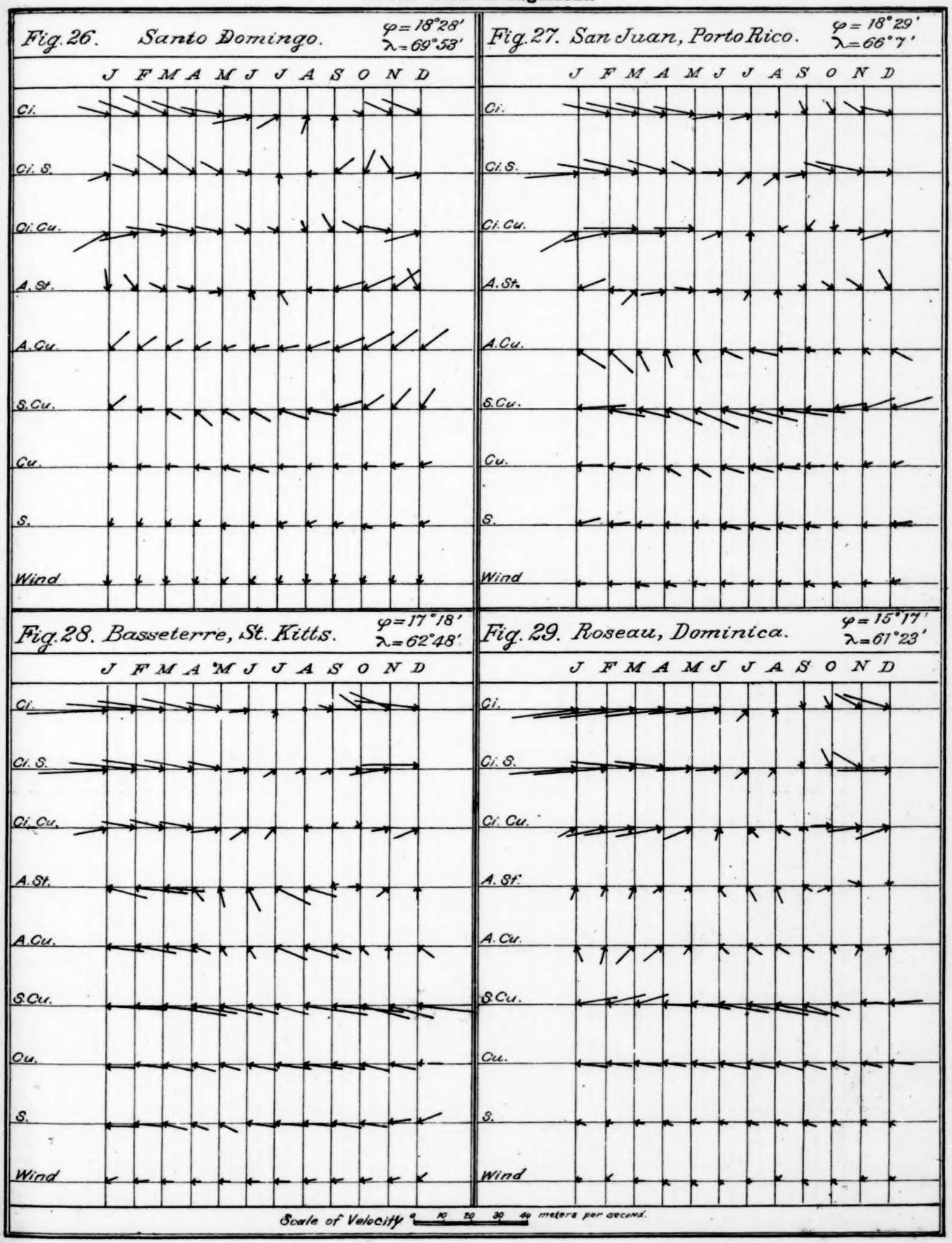
Fig. 26. Santo Domingo. φ = 18°28' λ = 69°53'
Fig. 27. San Juan, Porto Rico. φ = 18°29' λ = 66°7'
Fig. 28. Basseterre, St. Kitts. φ = 17°18' λ = 62°48'
Fig. 29. Roseau, Dominica. φ = 15°17' λ = 61°23'
J F M A M J J A S O N D
Ci.
Ci. S.
Ci. Cu.
A. St.
A. Cu.
S. Cu.
Cu.
S.
Wind
Scale of Velocity 0 10 20 30 40 meters per second.

Chart XII C. Average monthly vectors of the general circulation in the West Indies at the various cloud levels. First arrangement.

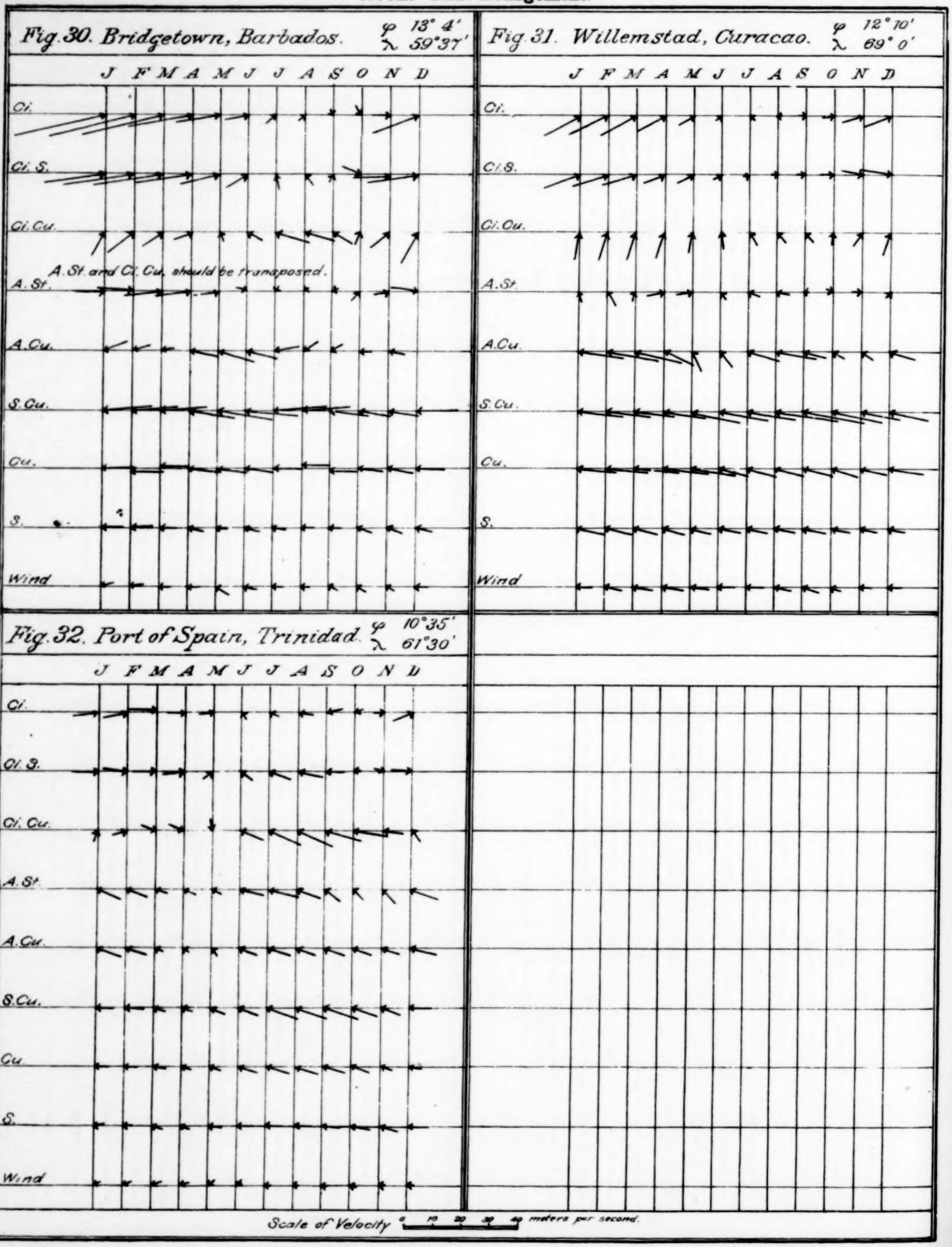
Fig. 30. Bridgetown, Barbados. φ 13° 4' λ 59° 37'
Fig. 31. Willemstad, Curacao. φ 12° 10' λ 69° 0'
J F M A M J J A S O N D
Ci.
Ci. S.
Ci. Cu.
A. St. and Ci. Cu. should be transposed.
A. St.
A. Cu.
S. Cu.
Cu.
S.
Wind
Fig. 32. Port of Spain, Trinidad. φ 10° 35' λ 61° 30'
Scale of Velocity 0 10 20 30 40 meters per second.

Chart XIII A. Average monthly vectors of the general circulation in the West Indies at the various cloud levels. Second arrangement.

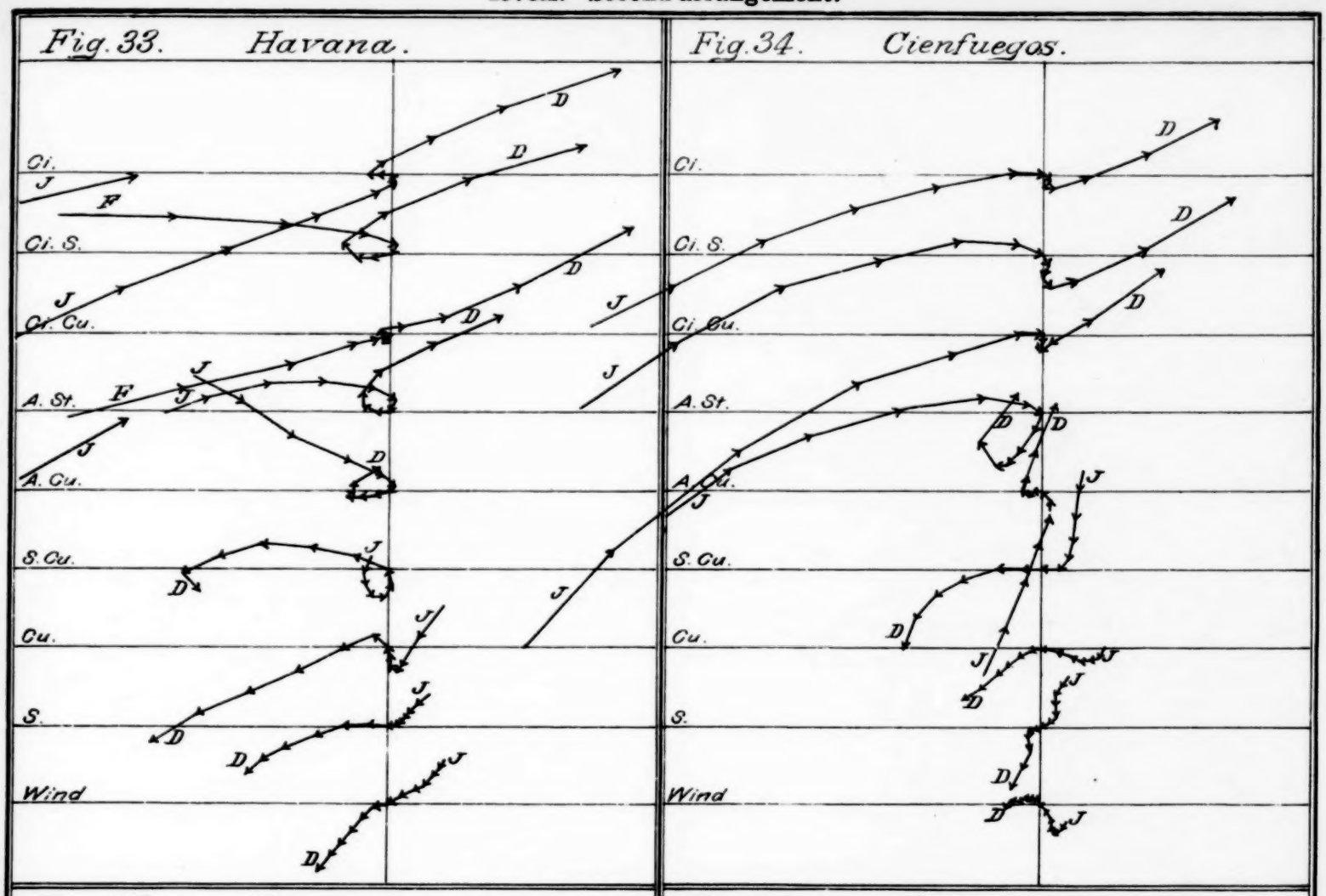

Chart XIII B. Average monthly vectors of the general circulation in the West Indies at the various cloud levels. Second arrangement.

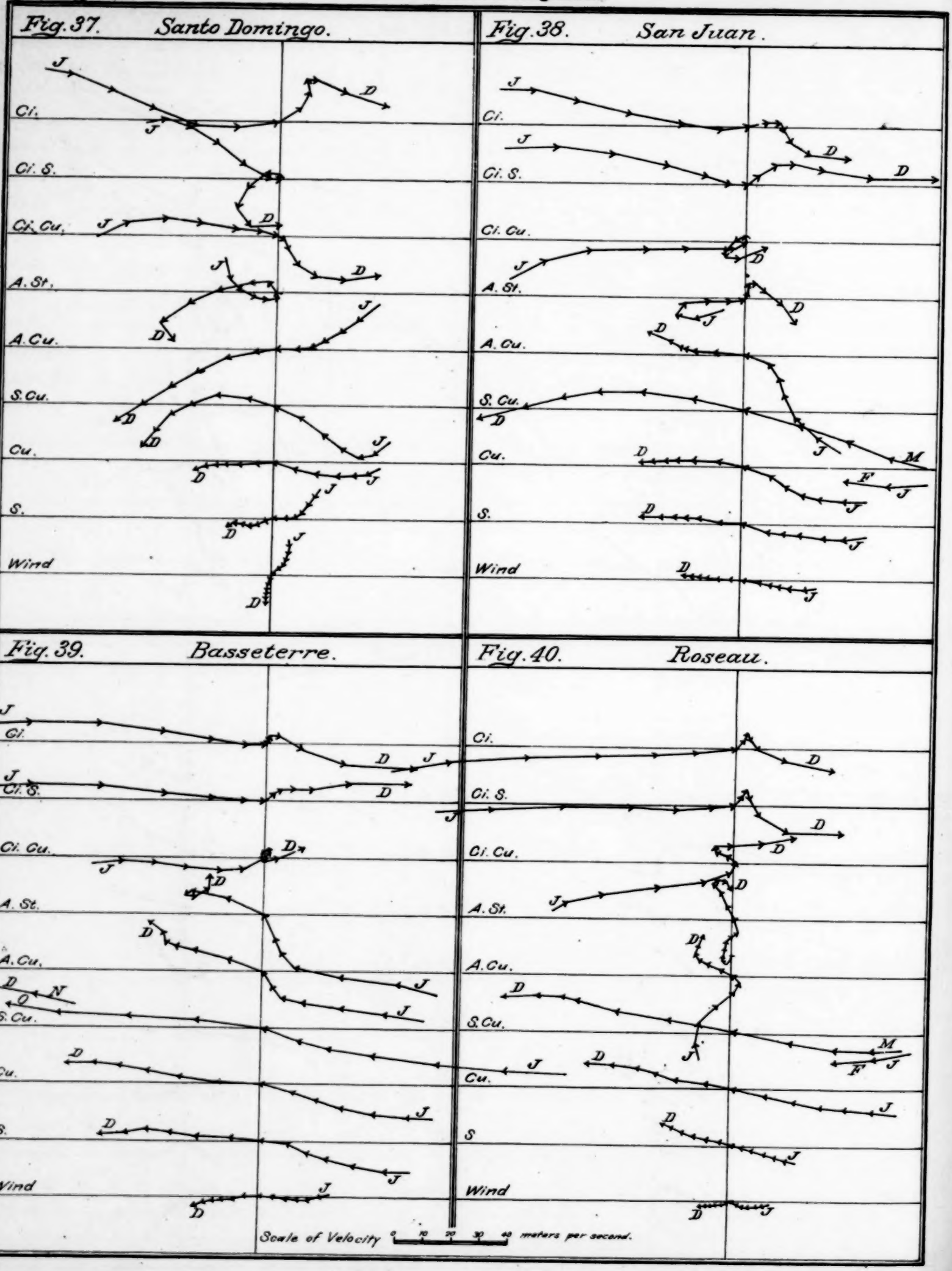

Chart XIII C. Average monthly vectors of the general circulation in the West Indies at the various cloud levels. Second arrangement.

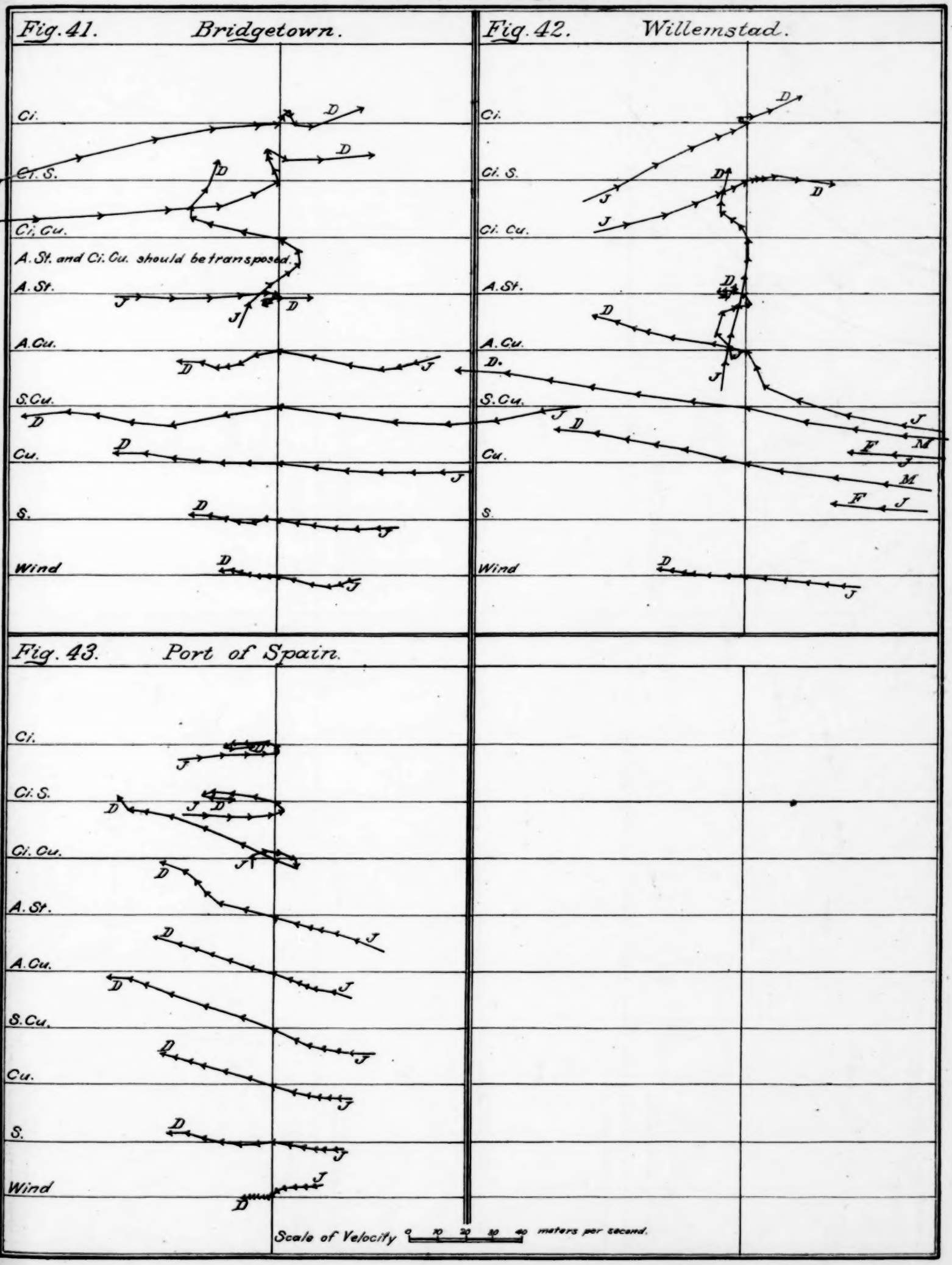

Chart XIV A. Average seasonal vectors of the general circulation in the West Indies at the various cloud levels.

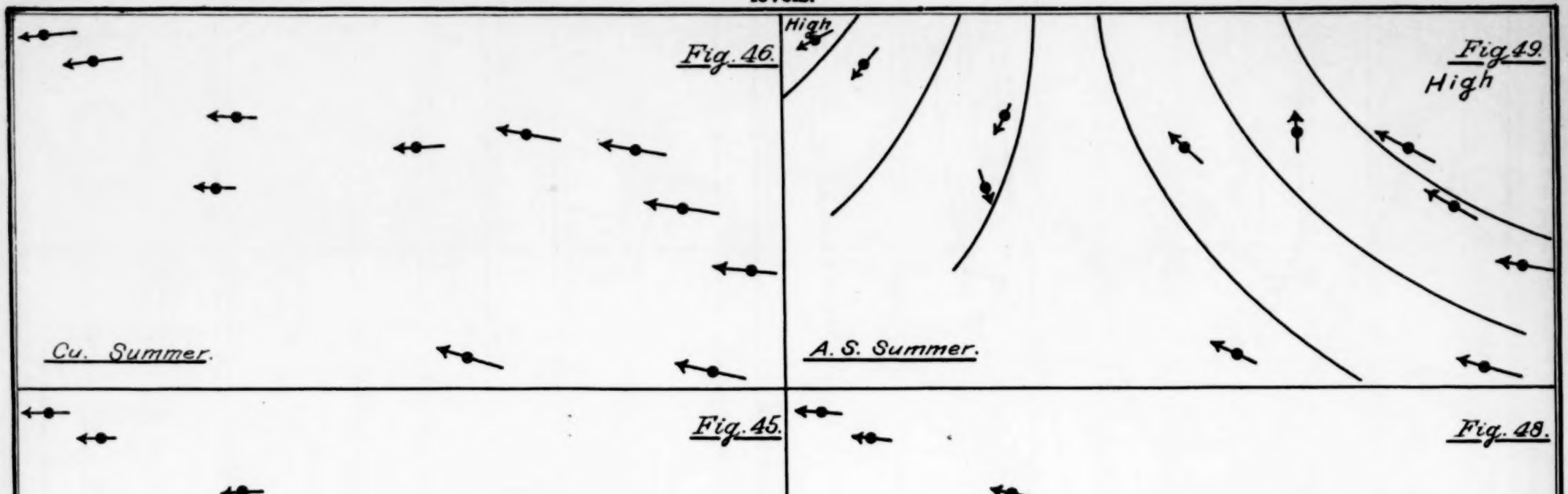

Chart XIV B. Average seasonal vectors of the general circulation in the West Indies at the various cloud levels.

Chart XIV B. Average seasonal vectors of the general circulation in the West Indies at the various cloud levels.

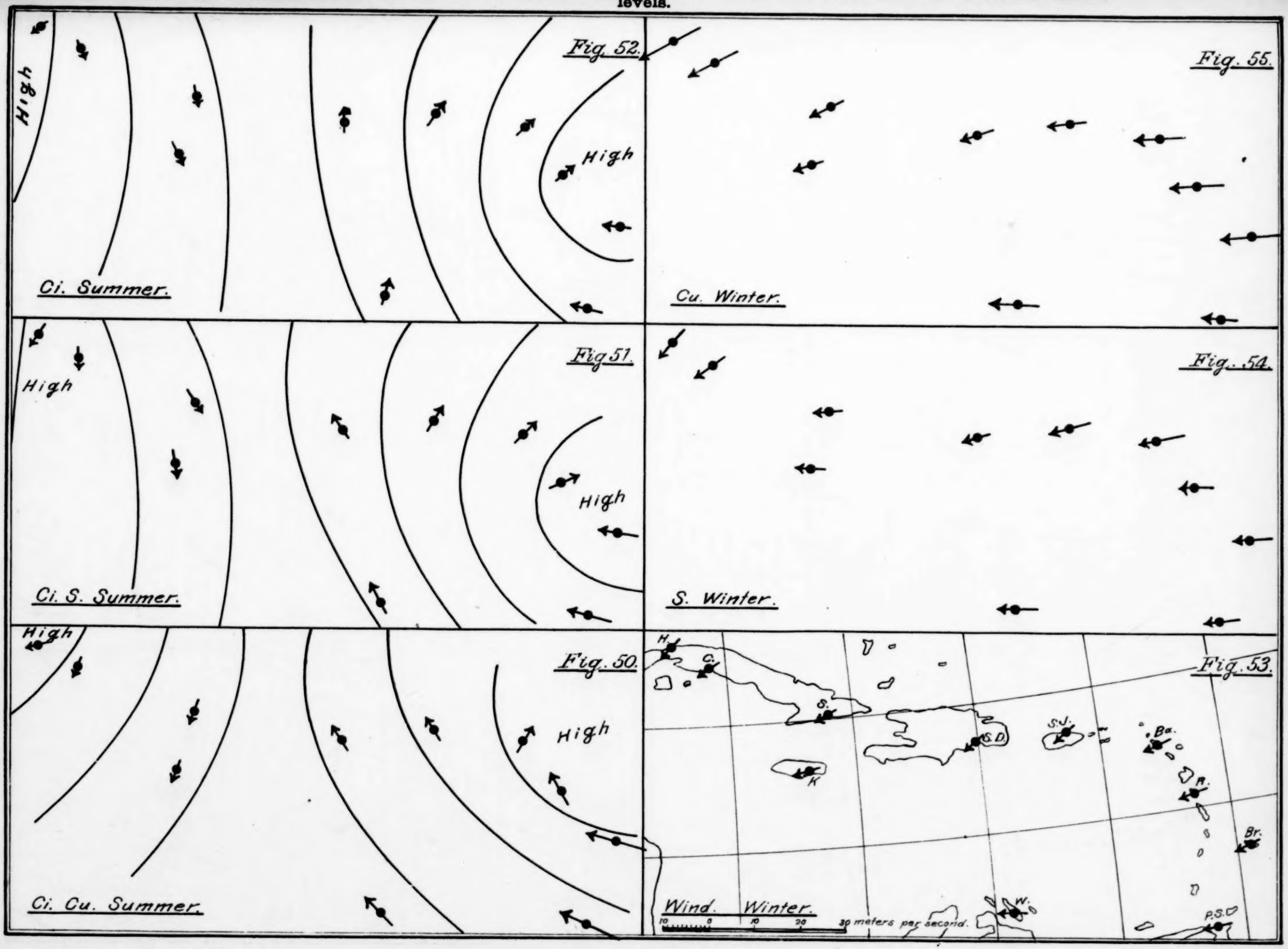
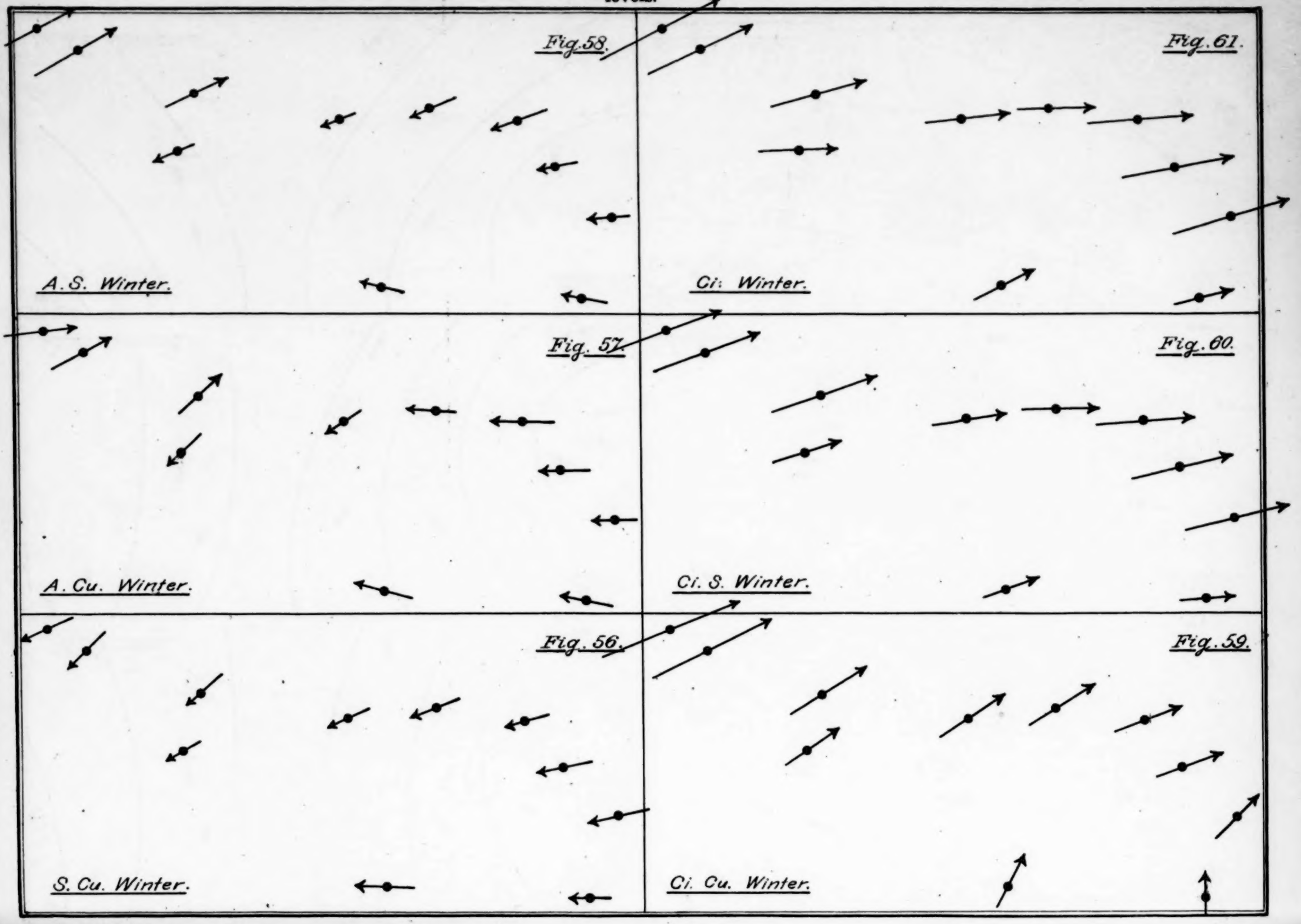
Chart XIV C. Average seasonal vectors of the general circulation in the West Indies at the various cloud levels.